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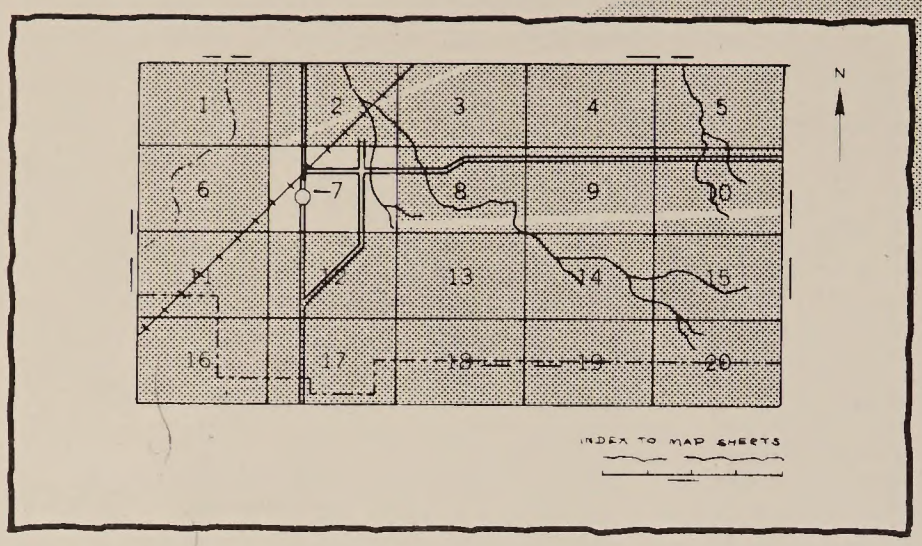
Soil Survey of Josephine County Oregon

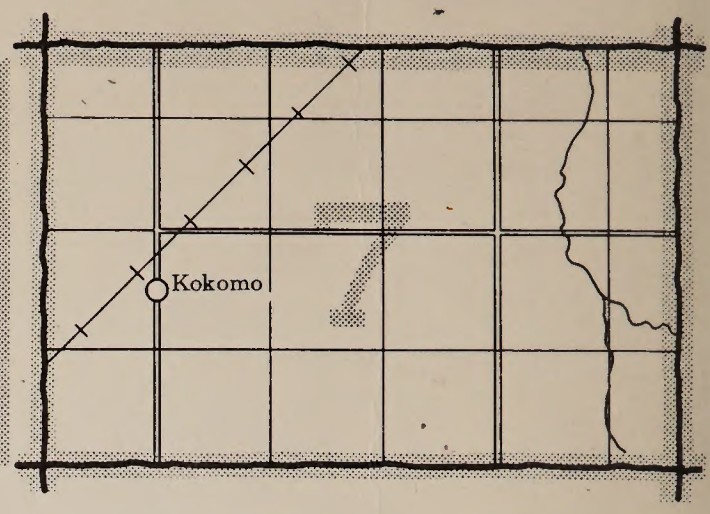


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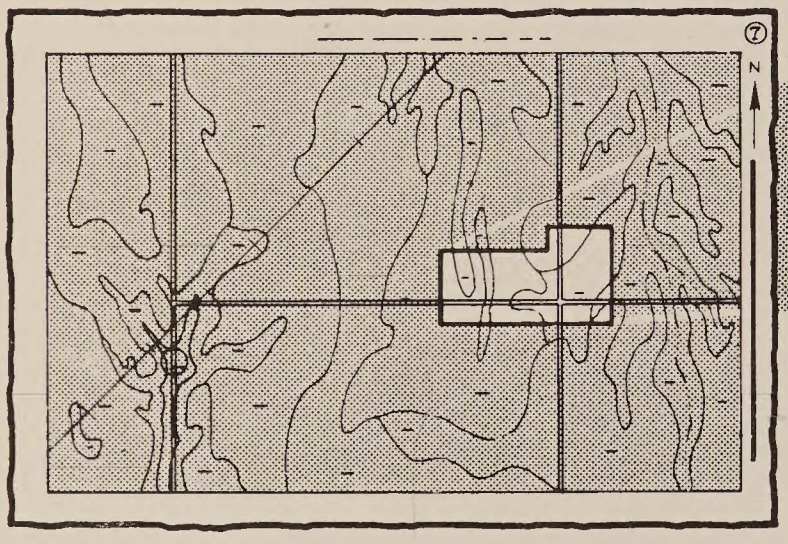
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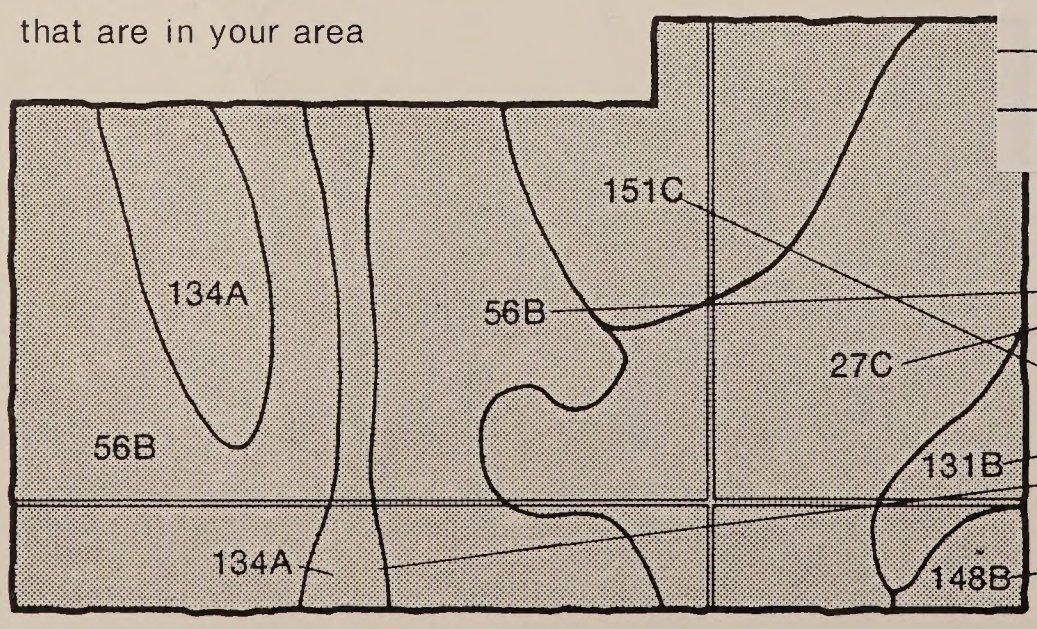
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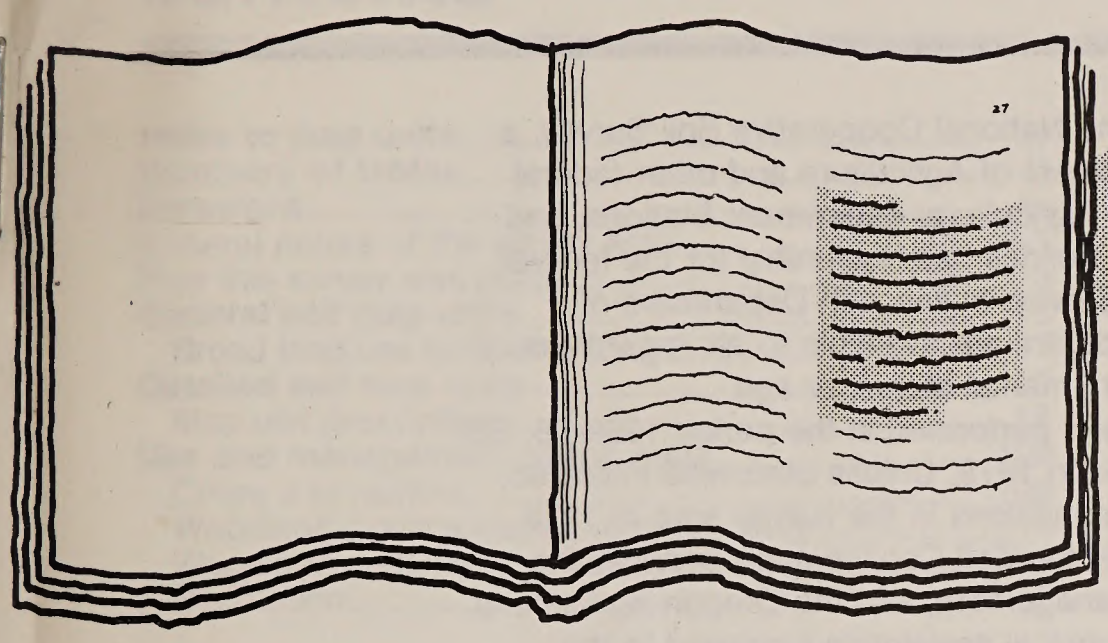


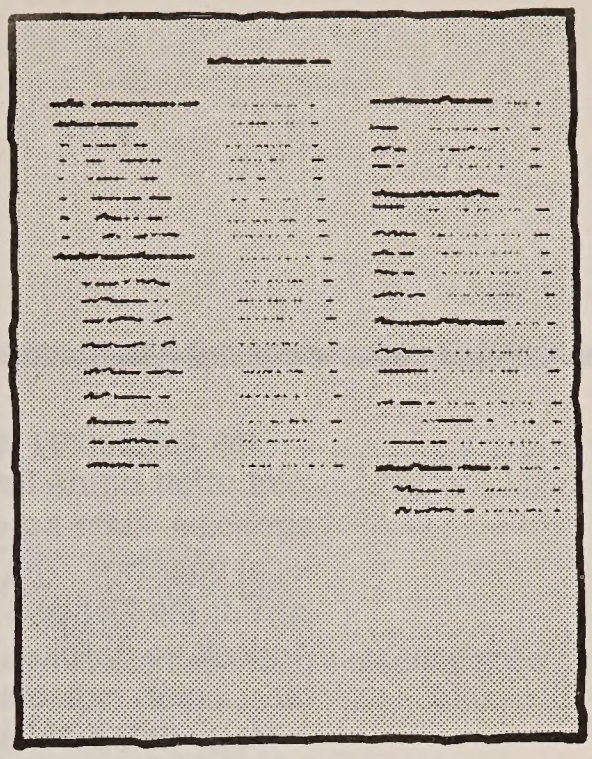
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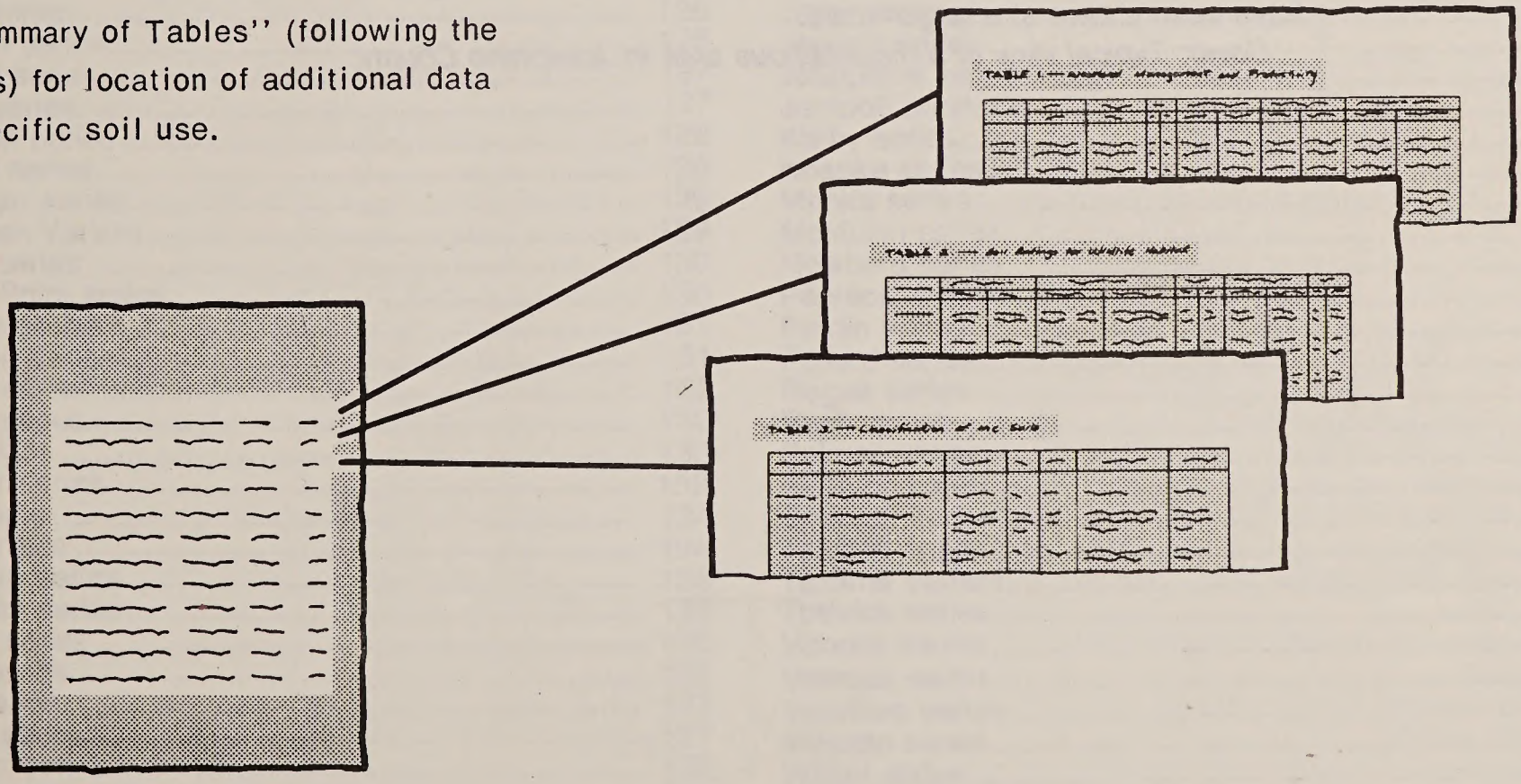
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.





6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1969-78. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, the Bureau of Land Management, and the Oregon Agricultural Experiment Station. It is part of the technical assistance furnished to the Josephine and Illinois Valley Soil and Water Conservation Districts.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Typical view of a mountainous area in Josephine County.

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contents

Index to map units iv
Summary of tables vi
Foreword ix
General nature of the survey area 1
How this survey was made 3
General soil map units 5
Broad land use considerations 11
Detailed soil map units 13
Map unit descriptions 13
Use and management of the soils 109
Crops and pasture 109
Woodland management and productivity 111
Woodland understory vegetation 112
Recreation 113
Wildlife habitat 115
Engineering 116
Soil properties 121
Engineering index properties 121
Physical and chemical properties 122
Soil and water features 123
Physical and chemical analyses of selected soils 124
Engineering index test data 124
Classification of the soils 125
Soil series and their morphology 125
Formation of the soils 153
References 159
Glossary 161
Tables 169

soil series

Abegg series 125
Althouse series 126
Banning series 127
Barron series 127
Beekman series 128
Bigelow series 128
Brockman series 129
Brockman Variant 129
Camas series 130
Central Point series 130
Clawson series 131
Colestine series 131
Copsey series 132
Cornutt series 132
Cove series 133
Crannler series 133
Cryaquepts 134
Cryumbrepts 134
Debenger series 135
Dubakella series 135
Eightlar series 136
Evans series 136
Fantz series 137
Foehlin series 137
Goodwin series 138
Holland series 138
Jayar series 139
Jerome series 139
Josephine series 140
Jumpoff series 141
Kerby series 141
Knapke series 142
Manita series 142
McMullin series 143
Newberg series 143
Pearsoll series 144
Perdin series 144
Pollard series 145
Rogue series 145
Ruch series 146
Selmac series 146
Siskiyou series 147
Speaker series 147
Takilma series 148
Takilma Variant 148
Tethrick series 149
Vannoy series 150
Vermisa series 150
Voorhies series 151
Wapato series 151
Witzel series 152
Woodseye series 152

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index to map units

1B—Abegg gravelly loam, 2 to 7 percent slopes..... 13
1C—Abegg gravelly loam, 7 to 12 percent slopes 14
1D—Abegg gravelly loam, 12 to 20 percent slopes... 15
2F—Althouse very gravelly silt loam, 35 to 75 percent north slopes 17
3F—Althouse very gravelly silt loam, 35 to 75 percent south slopes..... 17
4—Banning loam 18
5B—Barron coarse sandy loam, 2 to 7 percent slopes..... 19
5C—Barron coarse sandy loam, 7 to 12 percent slopes..... 22
6F—Beekman-Colestine complex, 50 to 80 percent north slopes..... 23
7F—Beekman-Colestine complex, 50 to 75 percent south slopes 24
8G—Beekman-Vermisa complex, 60 to 100 percent north slopes..... 25
9G—Beekman-Vermisa complex, 60 to 100 percent south slopes 26
10E—Bigelow very gravelly sandy loam, 5 to 35 percent slopes 28
10F—Bigelow very gravelly sandy loam, 35 to 65 percent slopes 28
11B—Brockman clay loam, 2 to 7 percent slopes 29
11C—Brockman clay loam, 7 to 12 percent slopes ... 30
12B—Brockman cobbly clay loam, 2 to 7 percent slopes..... 30
12D—Brockman cobbly clay loam, 7 to 20 percent slopes..... 31
13—Brockman Variant very gravelly loam 33
14—Camas gravelly sandy loam..... 33
15—Camas-Newberg complex 34
16—Central Point sandy loam 35
17B—Clawson sandy loam, 2 to 7 percent slopes..... 35
18A—Copsey clay, 0 to 3 percent slopes..... 36
18B—Copsey clay, 3 to 7 percent slopes..... 37
19D—Cornutt-Dubakella complex, 7 to 20 percent slopes..... 38
19E—Cornutt-Dubakella complex, 20 to 35 percent slopes..... 39
20F—Cornutt-Dubakella complex, 35 to 55 percent north slopes..... 40
21F—Cornutt-Dubakella complex, 35 to 55 percent south slopes 41
22—Cove silty clay loam 42
23G—Crannler very stony sandy loam, 50 to 90 percent slopes 43
24G—Crannler-Rock outcrop complex, 50 to 100 percent slopes 44
25E—Cryaquepts, 0 to 30 percent slopes 44
26F—Cryumbrepts, very steep 44
27C—Debenger loam, 7 to 12 percent slopes..... 45
27D—Debenger loam, 12 to 20 percent slopes..... 46
28F—Dubakella-Pearsoll complex, 35 to 75 percent north slopes..... 46
29F—Dubakella-Pearsoll complex, 35 to 70 percent south slopes 47
30—Dumps 48
31D—Eightlar extremely stony clay, 5 to 20 percent slopes..... 48
31E—Eightlar extremely stony clay, 20 to 35 percent slopes 49
32F—Eightlar-Dubakella complex, 35 to 65 percent north slopes..... 50
33F—Eightlar-Dubakella complex, 35 to 65 percent south slopes 51
34—Evans loam 51
35F—Fantz-Knapke complex, 35 to 85 percent north slopes..... 52
36F—Fantz-Knapke complex, 35 to 85 percent south slopes..... 53
37G—Fantz-Rock outcrop complex, 60 to 100 percent slopes 53
38A—Foehlin gravelly loam, 0 to 3 percent slopes.... 54
38C—Foehlin gravelly loam, 3 to 12 percent slopes.. 54
39D—Goodwin very stony sandy loam, 5 to 35 percent slopes 55
40F—Goodwin very stony sandy loam, 35 to 65 percent north slopes 56
41F—Goodwin very stony sandy loam, 35 to 65 percent south slopes..... 57
42B—Holland sandy loam, cool, 2 to 7 percent slopes..... 58
42C—Holland sandy loam, cool, 7 to 12 percent slopes..... 59
42D—Holland sandy loam, cool, 12 to 20 percent slopes..... 60
42E—Holland sandy loam, cool, 20 to 35 percent slopes..... 61
43E—Jayar very gravelly loam, 20 to 35 percent slopes..... 62
44F—Jayar very gravelly loam, 35 to 70 percent north slopes..... 63
45F—Jayar very gravelly loam, 35 to 70 percent south slopes 63
46—Jerome sandy loam..... 64

47E—Josephine gravelly loam, 20 to 35 percent slopes 65
48F—Josephine gravelly loam, 35 to 55 percent north slopes 67
49D—Jumpoff clay loam, 7 to 20 percent slopes 68
49E—Jumpoff clay loam, 20 to 35 percent slopes 69
50F—Jumpoff clay loam, 35 to 50 percent north slopes 70
51F—Jumpoff clay loam, 35 to 50 percent south slopes 70
52—Kerby loam 71
53B—Manita loam, 2 to 7 percent slopes 72
53C—Manita loam, 7 to 12 percent slopes 73
53D—Manita loam, 12 to 20 percent slopes 74
53E—Manita loam, 20 to 35 percent slopes 76
54F—Manita loam, 35 to 50 percent north slopes 76
55F—Manita loam, 35 to 50 percent south slopes 77
56F—McMullin gravelly loam, 30 to 60 percent slopes 78
57—Newberg fine sandy loam 78
58F—Pearsoll-Rock outcrop complex, 20 to 60 percent slopes 79
58G—Pearsoll-Rock outcrop complex, 60 to 90 percent slopes 79
59F—Perdin cobbly loam, 30 to 50 percent north slopes 80
60F—Perdin cobbly loam, 30 to 50 percent south slopes 80
61B—Pollard loam, 2 to 7 percent slopes 81
61C—Pollard loam, 7 to 12 percent slopes 82
61D—Pollard loam, 12 to 20 percent slopes 83
61E—Pollard loam, 20 to 35 percent slopes 84
62F—Pollard gravelly loam, 35 to 50 percent slopes. 85
63F—Pollard-Beekman complex, 12 to 70 percent slopes 86
64—Riverwash 87
65F—Rogue-Goodwin complex, 35 to 70 percent north slopes 87
66F—Rogue-Goodwin complex, 35 to 70 percent south slopes 88
67B—Ruch gravelly silt loam, 2 to 7 percent slopes.. 90
67C—Ruch gravelly silt loam, 7 to 12 percent slopes 91
68B—Selmac loam, 2 to 7 percent slopes 92
68D—Selmac loam, 7 to 20 percent slopes 93
69E—Siskiyou gravelly sandy loam, 20 to 35 percent slopes 94
70F—Siskiyou gravelly sandy loam, 35 to 70 percent north slopes 94
71F—Siskiyou gravelly sandy loam, 35 to 60 percent south slopes 95
72F—Speaker-Josephine gravelly loams, 35 to 55 percent south slopes 96
73—Takilma cobbly loam 97
74—Takilma Variant extremely cobbly loam 98
75F—Tethrick gravelly fine sandy loam, 45 to 70 percent north slopes 98
76F—Tethrick gravelly fine sandy loam, 45 to 65 percent south slopes 99
77E—Vannoy silt loam, 20 to 35 percent slopes 99
78F—Vannoy silt loam, 35 to 55 percent north slopes 100
79F—Vannoy-Voorhies complex, 35 to 55 percent south slopes 101
80G—Vermisa-Beekman complex, 60 to 100 percent north slopes 102
81G—Vermisa-Beekman complex, 60 to 100 percent south slopes 103
82G—Vermisa-Rock outcrop complex, 60 to 100 percent south slopes 104
83—Wapato silt loam 104
84F—Witzel-Rock outcrop complex, 30 to 75 percent slopes 105
85G—Woodseye very gravelly loam, 50 to 90 percent south slopes 106
86G—Woodseye-Jayar complex, 50 to 90 percent north slopes 107
87F—Woodseye-Rock outcrop complex, 20 to 60 percent slopes 108

summary of tables

Temperature and precipitation (table 1) 170

Freeze dates in spring and fall (table 2) 173
Probability. Temperature.

Growing season (table 3) 175
Probability. Daily minimum temperature.

Acreage and proportionate extent of the soils (table 4) 176
Acres. Percent.

Yields per acre of crops and pasture (table 5) 178
Alfalfa hay. Grass hay. Pasture. Corn silage.

Woodland management and productivity (table 6) 181
Ordination symbol. Management concerns. Potential productivity. Trees to plant.

Woodland understory vegetation (table 7) 186
Total production. Characteristic vegetation. Composition.

Recreational development (table 8) 194
Camp areas. Picnic areas. Playgrounds. Paths and trails.

Wildlife habitat potentials (table 9) 201
Potential for habitat elements. Potential as habitat for—Openland wildlife, Woodland wildlife, Wetland wildlife.

Building site development (table 10) 207
Shallow excavations. Dwellings without basements. Dwellings with basements. Small commercial buildings. Local roads and streets.

Sanitary facilities (table 11) 213
Septic tank absorption fields. Sewage lagoon areas. Trench sanitary landfill. Area sanitary landfill. Daily cover for landfill.

Construction materials (table 12) 220
Roadfill. Sand. Gravel. Topsoil.

Water management (table 13) 227
Limitations for—Pond reservoir areas; Embankments, dikes, and levees. Features affecting—Drainage, Irrigation, Terraces and diversions, Grassed waterways.

Engineering index properties (table 14) 233
Depth. USDA texture. Classification—Unified, AASHTO. Fragments greater than 3 inches. Percentage passing sieve number—4, 10, 40, 200. Liquid limit. Plasticity index.

Physical and chemical properties of the soils (table 15) 242
Depth. Clay less than 2 millimeters. Moist bulk density. Permeability. Available water capacity. Soil reaction. Shrink-swell potential. Erosion factors. Organic matter.

Soil and water features (table 16)..... 247
Hydrologic group. Flooding. High water table. Bedrock. Potential frost action. Risk of corrosion.

Physical characteristics of selected soils (table 17)..... 252
Depth. Horizon. Particle-size distribution. Bulk density. Water content.

Chemical characteristics of selected soils (table 18)..... 254
Depth. Organic matter. Organic carbon. Extractable iron. pH in water. Extractable cations. Extractable phosphorus. Clay mineralogy.

Engineering index test data for selected soils (table 19)..... 257
Depth. Percentage passing sieve number—4, 10, 40, 200. Moisture-density. Liquid limit. Plasticity index.

Classification of the soils (table 20)..... 258
Family or higher taxonomic class.

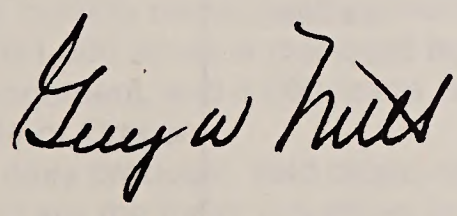
foreword

This soil survey contains information that can be used in land-planning programs in Josephine County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

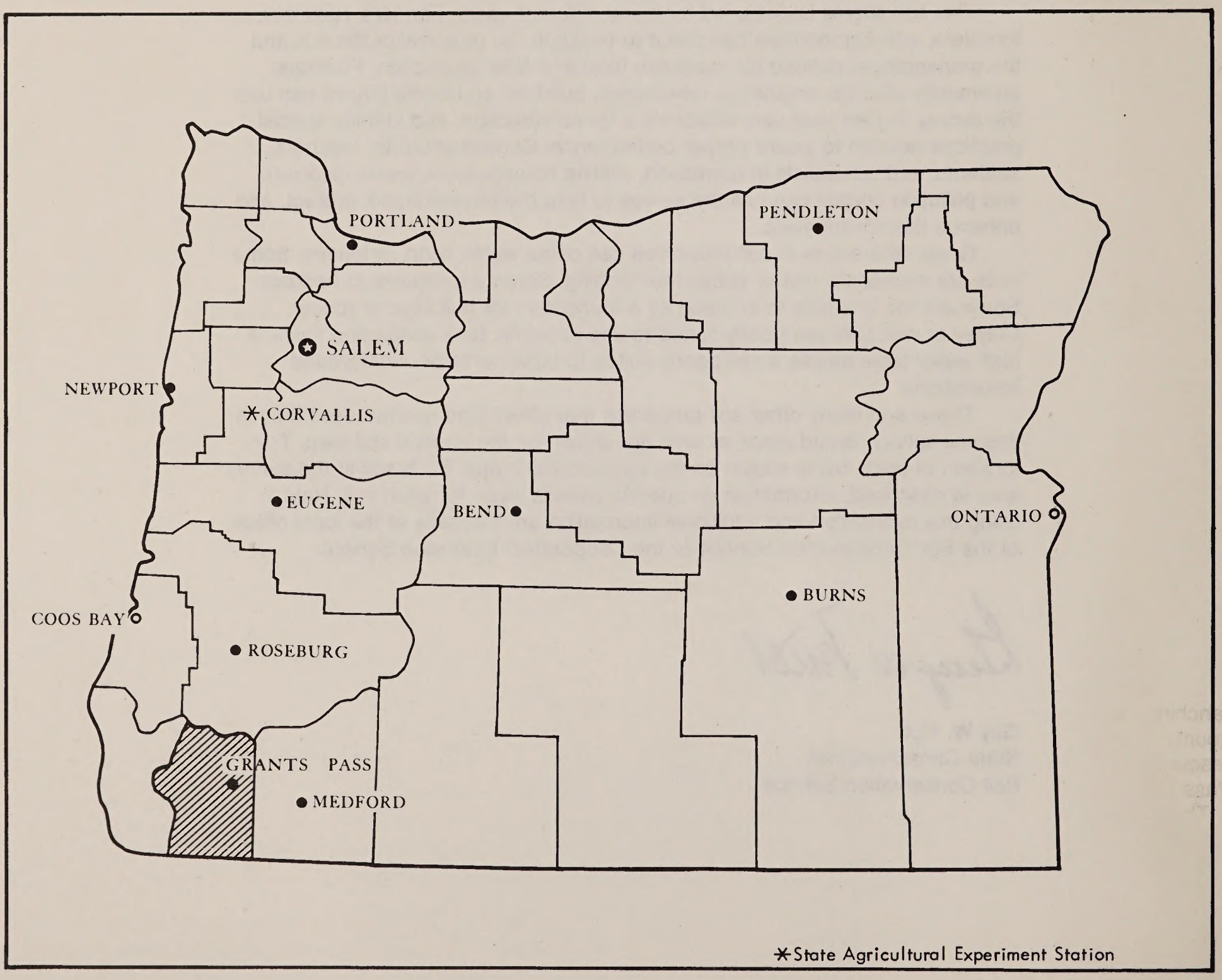
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Guy W. Nutt
State Conservationist
Soil Conservation Service



Location of Josephine County in Oregon.

soil survey of
Josephine County, Oregon

By Roger Borine, Soil Conservation Service

Fieldwork by Roger Borine, Duane Setness, Allen Gerig, Richard Herriman, and Laurel Mueller, Soil Conservation Service; Roy Meyer, Forest Service; and Steve Shade, Bureau of Land Management

United States Department of Agriculture, Soil Conservation Service and Forest Service, and United States Department of the Interior, Bureau of Land Management, in cooperation with Oregon Agricultural Experiment Station

JOSEPHINE COUNTY is in the southwestern part of Oregon. Grants Pass, the largest city in the county, is the county seat. Josephine County is in the Klamath Mountains physiographic province. The county is characterized by steep, rugged mountains and narrow river valleys. Elevation ranges from 750 feet on the river flood plains to more than 7,000 feet on the higher mountains.

The total area of Josephine County is about 1,040,000 acres, of which about 316,000 acres is privately owned and about 724,000 acres is publicly owned. About 365,000 acres of the publicly owned land is managed by the Forest Service, 351,000 acres is managed by the Bureau of Land Management, and 8,000 acres is managed by the state of Oregon.

Lumber products, dairy products, field crops, cattle ranching, and tourism are the major industries in the county. The Rogue River and its tributaries provide many resources for industries throughout the county. Grants Pass is the only community that has rail service.

The average annual rainfall ranges from 30 to 80 inches. The climate is warm and dry in summer and cool and moist in winter. At the higher elevations the snowpack may remain until late in spring. Streamflow is greatly diminished by late in summer.

Descriptions, names, and delineations of soils in this survey do not fully agree with those on soil maps for adjacent counties. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey.

general nature of the survey area

This section briefly discusses the history and development; physiography, relief, and drainage; and climate of the survey area.

history and development

The Takelma Indians were the predominant group of people in Josephine County prior to the coming of white men. The only cultivated crop was tobacco. The staple vegetables of the Takelmas were acorns, camas bulbs, manzanita berries, and sugar pine nuts. Fish, deer, and elk were also used as food.

In 1827, Peter Skene Ogden led a group of men on a trapping expedition into what is now Josephine County (*3*). Beaver were trapped on the Applegate and Rogue Rivers. Ogden wrote that beaver were not plentiful and that the furs were not of the high quality of those in other regions. He blamed this on the mildness of the climate.

Twenty years before the gold rush of the 1850's, Hudson's Bay Company trappers opened a route through the Siskiyou Mountains to California. This trail became an important route during the gold rush days. It eventually became a road, and then a route for the

railroad. It is now closely paralleled by Interstate Highway 5.

The recorded history of what is now Josephine County dates back to 1851. Prospectors discovered gold in the Illinois Valley, and news of the discovery prompted many men to come in search of gold. This was the first mining area in Oregon (*14*). The amount of gold produced in the county equaled or surpassed that of almost all other areas in Oregon.

Josephine County was organized by an act of the territorial legislature in 1856. The county got its name from Josephine Creek, which was named after Miss Josephine Rawlins, or Rollins. She was at one time the only white female in the county. The first county seat was Waldo, followed by Althouse and Kirbyville. Since 1888 Grants Pass has been the county seat.

In the late 1850's there was a drastic decline in mining because many of the rich, easily mined deposits had been exhausted. Many people moved away, and the population decreased.

Although the first settlers in Josephine County were engaged mainly in gold mining, lumbering and farming soon became important industries. Lumber was used for mining operations, and crops were grown for local consumption.

The timber industry became more important when railroad service began in 1888. Production of lumber to be shipped to distant markets became the county's leading industry. Demand for lumber during World War II resulted in a tremendous expansion of the timber industry.

Farming in Josephine County was developed to supply the needs of the local miners. It was limited by the dry summers and the scarcity of soils suitable for dryfarming. Because early farmers were unfamiliar with modern soil management, they used practices that caused the productivity of the soils to decrease. For this reason the cultivated land was subsequently used mostly for hay and pasture.

About 1900 the introduction of soil-improving crops and other more intensive farming practices revitalized the farming industry in Josephine County. The number of farmers increased, and a succession of new crops dominated farming in the county during the following decades. The main agricultural enterprises in the county today are growing forage crops and specialty field crops and raising livestock.

Forage crops and several specialty field crops are grown in the river valleys. Irrigation water is provided by wells and diversions from streams and rivers. A system of ditches has been developed by the Grants Pass Irrigation District, which was formed in 1916. Farms in this area have shown a marked trend toward reduction in size, most commonly to plots of 3 to 10 acres. The production of intensively cultivated crops in Josephine County rose, peaked, and then subsided in response to market conditions. The cultivated land was then returned to hay and pasture.

Soil Conservation District legislation was enacted by the Oregon Legislature in 1939. Farmers and ranchers in the northern part of Josephine County recognized the problems of flooding, soil erosion, stream pollution, and inadequate land use planning. For these reasons they organized the Josephine Soil and Water Conservation District on December 30, 1939. The Illinois Valley Soil and Water Conservation District was organized on December 13, 1949.

Tourism is extremely important to the economy of the area. The main recreational activities are visiting the Oregon Caves National Monument, floating on the wild rivers, and fishing for salmon and steelhead. Mining activity is increasing. The major emphasis is on exploration and development of mines for gold, silver, copper, nickel, and other rare metals. The county is an important source of sand, gravel, and stone.

physiography, relief, and drainage

Josephine County is characterized by steep, rugged mountains and narrow river valleys. The Klamath Mountains and the Siskiyou Mountains in the southeastern part of the county are the principal mountains. Slopes are long and generally are dissected. The mountains are made up of altered volcanic and sedimentary rock and intrusive igneous rock. The layered rocks have been steeply folded, faulted, and, in places, intruded by granitic rock and peridotite, much of which has been altered to serpentinite. The mountains on the western boundary commonly are less than 4,500 feet in elevation, and the mountains on the eastern boundary are as much as 7,000 feet or more. There is evidence of glaciation at the higher elevations. Small cirque lakes are in many of the glacial basins.

The valleys consist of flood plains, terraces, alluvial fans, and hills. The major flood plains are along the Rogue, Illinois, and Applegate Rivers. Areas subject to flooding range from narrow to broad. The terraces are rather broad, nearly level areas of water-deposited material. The alluvial fans are gently sloping areas at the mouths of streams and draws. These areas may receive deposits during periods of heavy rains. Low-lying hills are adjacent to or in the valleys. Most of these hills are remnants of larger landscapes that have been eroded.

This survey area is drained by three rivers—the Rogue River and its larger tributaries, the Illinois River and the Applegate River. The river valleys, which are irregularly scattered throughout the county, make up about 12 percent of the area. Mainly, they are the Rogue River Valley, which is a large central valley surrounding Grants Pass; the Applegate River Valley, which intersects the Rogue River Valley near Grants Pass; and the Illinois River Valley, which is in the south-central part of the county. Numerous small valleys are throughout the county. The streams in these valleys flow in a northerly or westerly direction and eventually drain into the Rogue River and its larger tributaries.

climate

The Pacific Ocean is about 30 to 40 miles west of Josephine County. The prevailing wind is from west to east. Thus, airmasses moving across the county are mainly of marine origin. However, the airmasses are considerably modified by their ascent over the Siskiyou Mountains and the Coast Range. As the air rises from sea level to an elevation of 4,000 to 5,000 feet, its temperature drops 3 to 5 degrees F for each 1,000-foot increase in elevation. This cooling causes much of the moisture in the incoming air to precipitate as rain or snow. Therefore, the air reaching the lower slopes and valley floors is much drier than the original marine air. The marine influence is reflected by the relatively mild winter temperatures and persistent cloudiness in winter (*9*).

Josephine County is in three distinct climatic zones, which can be related to landscape positions. They are the valley floor and lower slopes zone, which includes areas below 1,800 feet; the middle slopes zone, which includes areas between elevations of 1,800 to 4,500 feet; and the upper slopes zone, which includes areas above an elevation of 4,500 feet.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Cave Junction and Grants Pass, in the valley floor and lower slopes zone, and Sexton Summit, in the middle slopes zone. No weather station data were available for the upper slopes zone. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season. In the valley floor and lower slopes climatic zone, the average temperature in winter is 40 degrees F at Cave Junction and 41 degrees at Grants Pass. The average daily minimum temperature is 32 degrees at Cave Junction and 34 degrees at Grants Pass. The lowest temperature on record, which occurred at Cave Junction on December 10, 1972, is -6 degrees. In summer the average temperature is 67 degrees at Cave Junction and 69 degrees at Grants Pass. The highest recorded temperature, which occurred at Grants Pass on June 9, 1955, is 108 degrees.

In the middle slopes zone, the average and extreme temperatures occur later in spring and earlier in fall than in the valley floor and lower slopes zone. The average temperature in winter at Sexton Summit is 36 degrees and the average daily minimum temperature is 31 degrees. The average temperature in summer is 61 degrees.

In the upper slopes zone, freezing temperatures may occur at any time of the year. Temperatures rarely reach 100 degrees. The extreme temperatures recorded in this zone range from -20 degrees to more than 100 degrees. The mean monthly temperature ranges from 25 to 30 degrees in January to about 55 to 60 degrees in July.

Growing degree days, shown in Table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 5 to 7 inches, or about 15 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 5 inches. The heaviest 1-day rainfall during the period of record was 8.12 inches at Cave Junction on December 22, 1964. The amount of precipitation increases as elevation increases.

On the valley floors and lower slopes, most precipitation falls as rain. The amount of precipitation falling as snow increases at higher elevations. The average seasonal snowfall is 24 inches at Cave Junction, 9 inches at Grants Pass, and 114 inches at Sexton Summit. The greatest snow depth at any one time during the period of record was 18 inches at Cave Junction, 10 inches at Grants Pass, and 87 inches at Sexton Summit. On an average of 6 days at Cave Junction, 2 days at Grants Pass, and 34 days at Sexton Summit, at least 1 inch of snow is on the ground. However, the number of days varies greatly from year to year.

Precipitation late in fall, in winter, and early in spring is largely the result of storms moving in from the Pacific Ocean supplemented by condensation from the air as it rises over the mountains. Most of the rainfall late in spring, in summer, and early in autumn is the result of fairly local showers that are often associated with thunderstorms. Thunderstorm activity is most frequent in the mountainous areas.

Early in the morning the relative humidity generally is between 75 and 90 percent late in fall, in winter, and early in spring. During the warmer part of the day it averages 25 to 30 percent late in spring, in summer, and early in fall. The sun shines 65 percent of the time possible in summer and 30 percent in winter. Average windspeed is highest, 13 miles per hour, in winter.

In most winters, one or two storms occur in the area, bringing strong and sometimes damaging winds. The accompanying heavy rains cause serious flooding in some years. Every few years, either in winter or summer, a large continental airmass invades from the east, causing abnormal temperatures. In winter several consecutive days are well below freezing, and in summer a week or longer is sweltering.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape

of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

areas dominated by deep, well drained to excessively drained soils on flood plains

This group consists of one map unit. It makes up about 2 percent of the survey area. The soils in this group are on flood plains along the major rivers and streams throughout the county. They formed in alluvium of mixed origin.

This group is used mainly for irrigated hay and pasture, recreation, and wildlife habitat.

1. Newberg-Camas-Evans

Deep, well drained to excessively drained fine sandy loam, gravelly sandy loam, and loam

This map unit is mainly along the Applegate, Illinois, and Rogue Rivers. The vegetation in areas not cultivated is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 0 to 3 percent. Elevation is 750 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free season is 150 to 170 days.

This unit makes up about 2 percent of the survey area. It is about 30 percent Newberg soils, 25 percent Camas soils, and 15 percent Evans soils. The remaining 30 percent is Cove, Takilma, and Wapato soils, Dumps, and Riverwash.

Newberg, Camas, and Evans soils formed in alluvium derived dominantly from granitic rock and altered sedimentary and extrusive igneous rock. Unprotected areas of these soils are subject to occasional, brief periods of flooding.

Newberg soils are somewhat excessively drained. The surface layer is fine sandy loam. The substratum to a depth of 60 inches or more is stratified sandy loam, loamy fine sand, and loamy sand.

Camas soils are excessively drained. The surface layer is gravelly sandy loam, and the substratum is variegated very gravelly sand.

Evans soils are well drained. The surface layer is loam, and the substratum is silt loam and very fine sandy loam.

This unit is used mainly for irrigated hay and pasture, recreation, and wildlife habitat. A few areas are used for corn silage.

If this unit is used for irrigated hay and pasture, the main limitations are the hazard of flooding, droughtiness, and the gravelly surface layer of the Camas soils. Construction of dwellings, small buildings, roads, and recreation facilities is limited by the hazard of flooding.

areas dominated by deep, well drained to somewhat poorly drained soils on low stream terraces, alluvial fans, and hillsides and in drainageways

This group consists of four map units. It makes up about 9 percent of the survey area. The native vegetation in areas not cultivated is mainly conifers, hardwoods, shrubs, and grasses. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 48 to 55 degrees F, and the frost-free season is 120 to 170 days.

The soils in this group are well drained to somewhat poorly drained. They formed in alluvium derived dominantly from granitic rock, altered sedimentary and extrusive igneous rock, and ultramafic rock.

This group is used mainly for irrigated hay and pasture and as homesites. It is also used for timber production, corn silage, wildlife habitat, and recreation.

2. Takilma-Foehlin-Kerby

Deep, well drained cobbly loam, gravelly loam, and loam

This map unit is mainly on low stream terraces and alluvial fans in the Illinois, Applegate, and Rogue River Valleys. It is also in Deer Creek Valley and some other small valleys. The vegetation in areas not cultivated is

mainly conifers, hardwoods, shrubs, and grasses. Slopes are 0 to 12 percent. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the frost-free season is 140 to 170 days.

This unit makes up about 3 percent of the survey area. It is about 25 percent Takilma soils, 15 percent Foehlin soils, 15 percent Kerby soils, 5 percent Banning soils, and 5 percent Central Point soils. The remaining 35 percent is Brockman, Cove, Manita, Selmac, Takilma Variant, and Wapato soils.

Takilma and Kerby soils are on low stream terraces, and Foehlin soils are on low stream terraces and alluvial fans. These soils formed in alluvium derived dominantly from altered sedimentary and extrusive igneous rock.

The surface layer of the Takilma soils is cobbly loam. The subsoil is very cobbly loam, and the substratum is extremely cobbly sandy loam.

The surface layer of the Foehlin soils is gravelly loam, and the subsoil and substratum are gravelly clay loam.

The surface layer and subsoil of the Kerby soils is loam, and the substratum is extremely gravelly sandy loam and extremely gravelly sand.

This unit is used mainly for irrigated hay and pasture and as homesites. A few areas are used for corn silage and wildlife habitat.

If this unit is used for irrigated hay and pasture, the main limitation is the droughtiness of the Takilma soils. If the unit is used as homesites, the Kerby and Takilma soils have few limitations. The Foehlin soils are limited by moderately slow permeability, low soil strength, and shrinking and swelling of the subsoil.

3. Clawson-Jerome

Deep, somewhat poorly drained sandy loam

This map unit is mainly on alluvial fans and in drainageways in the Rogue River Valley. The vegetation in areas not cultivated is willows, grasses, and sedges. Slopes are 0 to 7 percent. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 52 to 55 degrees F, and the average frost-free season is 140 to 170 days.

This unit makes up about 1 percent of the survey area. It is about 45 percent Clawson soils and 20 percent Jerome soils. The remaining 35 percent is Barron, Cove, and Wapato soils.

Clawson and Jerome soils formed in alluvium derived dominantly from granitic rock.

The surface layer and subsoil of the Clawson soils are sandy loam. The substratum is sandy loam and coarse sandy loam.

The surface layer, subsoil, and substratum of the Jerome soils are sandy loam and are underlain by a buried soil of silty clay and clay.

If this unit is used for irrigated hay and pasture, the main limitation is wetness. If it is used as homesites, the main limitation is wetness on the Clawson soils and wetness, very slow permeability, and low soil strength on the Jerome soils.

4. Pollard-Abegg

Deep, well drained loam and gravelly loam

This map unit is mainly on high stream terraces and hillsides in the Illinois River Valley and Deer Creek valley. It is also in many other valleys throughout the county. The vegetation in areas not cultivated is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 2 to 20 percent. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free season is 140 to 170 days.

This unit makes up about 3 percent of the survey area. It is about 50 percent Pollard soils and 45 percent Abegg soils. The remaining 5 percent is Brockman Variant and Selmac soils.

Pollard and Abegg soils formed in alluvium and colluvium derived dominantly from altered sedimentary and extrusive igneous rock.

The surface layer of the Pollard soils is loam, and the subsoil is clay.

The surface layer of the Abegg soils is gravelly loam, the subsoil is very gravelly clay loam, and the substratum is extremely gravelly loamy sand.

This unit is used mainly for irrigated hay and pasture, homesites, and timber production. A few areas are used for recreation and wildlife habitat.

If this unit is used for irrigated hay and pasture, the main limitations are steepness of slope and droughtiness. The main limitation for homesites is the slow permeability of the Pollard soils. This unit has few limitations for timber production.

5. Brockman

Deep, moderately well drained cobbly clay loam and clay loam

This map unit is mainly on alluvial fans in the Illinois River Valley and in areas near the towns of Murphy, Merlin, and Hugo. The vegetation in areas not cultivated is conifers, hardwoods, shrubs, and grasses. Slopes are 2 to 20 percent. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free season is 120 to 170 days.

This unit makes up about 2 percent of the survey area. It is about 50 percent Brockman soils. The remaining 50 percent is Copsey, Cornutt, Dubakella, Jumpoff, and Selmac soils.

Brockman soils are on alluvial fans. They formed in alluvium derived dominantly from ultramafic rock. The surface layer is cobbly clay loam or clay loam, and the subsoil and substratum are cobbly clay.

This unit is used mainly for irrigated pasture and hay and for wildlife habitat. A few areas are used as homesites.

If this unit is used for irrigated pasture and hay, the main limitations are the low fertility of the soils and the very slow permeability of the subsoil. If this unit is used as homesites, the main limitations are wetness, low soil strength, and the very slow permeability of the subsoil.

areas dominated by moderately deep and deep, well drained and somewhat excessively drained soils on hillsides, toe slopes, and alluvial fans

This group consists of one map unit. It makes up about 3 percent of the survey area. The soils in this group are in the Grants Pass, Merlin, and Williams area. They formed in material derived dominantly from granitic rock. When the soils in this group are disturbed, the hazard of erosion is high.

This group is used mainly for irrigated hay and pasture and as homesites.

6. Holland-Barron-Siskiyou

Deep and moderately deep, well drained and somewhat excessively drained sandy loam, coarse sandy loam, and gravelly sandy loam

This map unit is mainly on hillsides, toe slopes, and alluvial fans in the Grants Pass, Merlin, and Williams areas. The vegetation in areas not cultivated is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 2 to 35 percent. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free season is 120 to 170 days.

This unit makes up about 3 percent of the survey area. It is about 70 percent Holland soils, 15 percent Barron soils, and 10 percent Siskiyou soils. The remaining 5 percent is Clawson, Jerome, and steep Siskiyou soils.

Holland, Barron, and Siskiyou soils formed in alluvium, colluvium, and residuum derived dominantly from granitic rock.

Holland soils are deep to granodiorite and are well drained. The surface layer and substratum are sandy loam. The subsoil is sandy clay loam.

Barron soils are deep and somewhat excessively drained. They are coarse sandy loam throughout.

Siskiyou soils are moderately deep to granodiorite and are somewhat excessively drained. The surface layer is gravelly sandy loam. The subsoil and substratum are sandy loam.

This unit is used mainly for irrigated hay and pasture and as homesites. A few areas are used for timber production and wildlife habitat.

If this unit is used for irrigated hay and pasture, the main limitation is the high hazard of erosion. If the unit is used as homesites, the main limitations on the Holland soils are moderately slow permeability, shrinking and swelling of the soils, and low strength of the subsoil. The Barron and Siskiyou soils are limited for use as homesites by steepness of slope.

areas dominated by shallow to deep, moderately well drained to somewhat excessively drained soils on mountainsides, hillsides, ridges, alluvial fans, and stream terraces

This group consists of eight map units. It makes up about 86 percent of the survey area. The native vegetation is mainly conifers, hardwoods, shrubs, and grasses. Elevation is 1,000 to 7,000 feet. The average annual precipitation is 30 to 70 inches, the average annual air temperature is 40 to 54 degrees F, and the frost-free season is less than 100 days to 170 days.

The soils in this group are moderately well drained to somewhat excessively drained. They formed in alluvium, colluvium, and residuum dominantly from granitic rock, altered sedimentary and extrusive igneous rock, and ultramafic rock.

This group is used mainly for timber production, wildlife habitat, watershed, and recreation.

7. Vannoy-Manita-Voorhies

Deep and moderately deep, well drained silt loam, loam, and very gravelly loam

This map unit is in areas throughout the county that receive less than 35 inches of precipitation. The vegetation is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 2 to 55 percent. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free season is 100 to 170 days.

This unit makes up about 6 percent of the survey area. It is about 40 percent Vannoy soils, 30 percent Manita soils, and 10 percent Voohries soils. The remaining 20 percent is Beekman, Colestine, Debenger, Jumpoff, McMullin, Ruch, Selmac, and Witzel soils.

Vannoy and Voorhies soils are on mountainsides. Manita soils are on mountainsides, hillsides, and alluvial fans. These soils formed in colluvium and alluvium derived dominantly from altered sedimentary and extrusive igneous rock.

Vannoy soils are moderately deep. The surface layer is silt loam. The subsoil is clay loam and is underlain by weathered metamorphic rock.

Manita soils are deep. The surface layer is loam. The subsoil is clay loam and clay and is underlain by metamorphic rock.

Voorhies soils are moderately deep. The surface layer is very gravelly loam. The subsoil is very gravelly clay loam and is underlain by fractured metamorphic rock.

The unit is used mainly for timber production, wildlife habitat, recreation, and watershed. A few areas are used as homesites.

The main limitation of this unit for most uses is steepness of slope. Minimizing the risk of erosion is

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essential in forest management. The main limitations for homesites in the gently sloping areas are moderately slow permeability and shrinking and swelling of the soils.

8. Josephine-Speaker-Pollard

Deep and moderately deep, well drained gravelly loam and loam

This map unit is mainly on mountainsides in areas throughout the county that receive more than 35 inches of precipitation. The vegetation is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 20 to 55 percent. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free season is 100 to 170 days.

This unit makes up about 17 percent of the survey area. It is about 60 percent Josephine soils, 20 percent Speaker soils, and 10 percent Pollard soils. The remaining 10 percent is Beekman, Colestine, Cornutt, Dubakella, Jumpoff, McMullin, and Witzel soils.

Josephine and Speaker soils are on mountainsides and ridges. Pollard soils are on high stream terraces, in saddles, and on hillsides. These soils formed in colluvium and residuum derived dominantly from altered sedimentary and extrusive igneous rock.

Josephine soils are deep to weathered metasedimentary rock. The surface layer is gravelly loam, and the subsoil is clay loam.

Speaker soils are moderately deep to weathered bedrock. The surface layer is gravelly loam, and the subsoil is gravelly clay loam.

Pollard soils are deep. The surface layer is loam, and the subsoil is clay.

The unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitation of this unit for most uses is the steepness of slope. Minimizing the risk of erosion is essential in forest management.

9. Beekman-Vermisa-Colestine

Moderately deep and shallow, well drained and somewhat excessively drained, extremely gravelly loam and gravelly loam

This map unit is mainly on mountainsides throughout the county in areas that receive more than 35 inches of precipitation. The vegetation is mainly conifers, hardwoods, shrubs, and grasses. Slopes are 50 to 100 percent. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free season is 100 to 160 days.

This unit makes up about 36 percent of the survey area. It is about 30 percent Beekman soils, 25 percent Vermisa soils, and 10 percent Colestine soils. The remaining 35 percent is Josephine, Jumpoff, Pollard, and Speaker soils and areas of Rock outcrop.

Beekman, Vermisa, and Colestine soils formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock.

Beekman soils are moderately deep to hard metamorphic rock and are well drained. The surface layer is gravelly loam, and the subsoil is very gravelly loam.

Vermisa soils are shallow to fractured metamorphic rock and are somewhat excessively drained. The surface layer is extremely gravelly loam, and the subsoil is very gravelly loam.

Colestine soils are moderately deep to hard metamorphic rock and are well drained. The surface layer is gravelly loam, and the subsoil is gravelly clay loam.

This unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitation of this unit for most uses is steepness of slope. Minimizing the risk of erosion is essential in forest management.

10. Siskiyou-Tethrick

Deep and moderately deep, somewhat excessively drained and well drained gravelly sandy loam and gravelly fine sandy loam

This map unit is mainly on mountainsides in the Grants Pass, Williams, and Grayback Mountain areas. Slopes are 35 to 70 percent. The vegetation is mainly conifers, hardwoods, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 55 degrees F, and the average frost-free season is 100 to 170 days.

This unit makes up about 3 percent of the survey area. It is about 70 percent Siskiyou soils and 25 percent Tethrick soils. The remaining 5 percent is Holland soils (fig. 1).

The Siskiyou and Tethrick soils formed in colluvium and residuum derived dominantly from granitic rock.

Siskiyou soils are moderately deep to granodiorite and are somewhat excessively drained. The surface layer is gravelly sandy loam, and the subsoil and substratum are sandy loam.

Tethrick soils are deep to quartz-diorite and are well drained. The surface layer is gravelly fine sandy loam, and the subsoil and substratum are fine sandy loam.

This unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitation of this unit for most uses is steepness of slope. Minimizing the risk of erosion is essential in forest management. The soils are subject to a high hazard of erosion when disturbed.

11. Pearsoll-Dubakella-Eightlar

Shallow to deep, well drained and moderately well drained extremely stony clay loam, very cobbly clay loam, and extremely stony clay

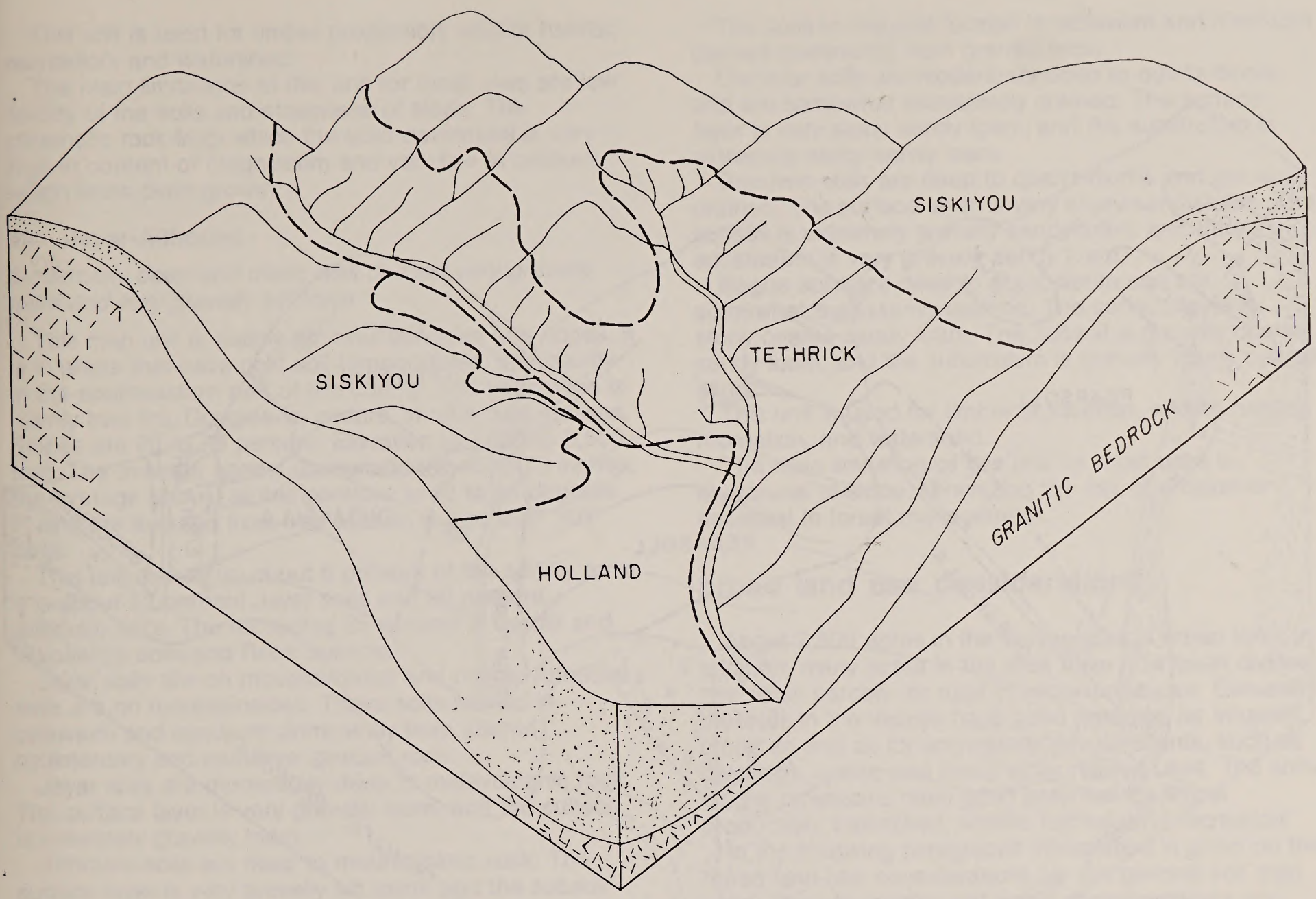


Figure 1.—Typical pattern of soils in the Siskiyou-Tethrick general map unit.

This map unit is mainly on mountainsides and alluvial fans in the southwestern part of the county. The vegetation is mainly Jeffrey pine, incense-cedar, shrubs, and grasses. Slopes are 5 to 90 percent. Elevation is 750 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free season is 100 to 170 days.

This unit makes up about 10 percent of the survey area. It is about 40 percent Pearsoll soils, 20 percent Dubakella soils, and 15 percent Eightlar soils. The remaining 25 percent is Brockman, Cornutt, and Perdin soils and Rock outcrop (fig. 2).

Pearsoll and Dubakella soils are mainly on mountainsides. Eightlar soils are on mountainsides and alluvial fans. These soils formed in colluvium, residuum, and alluvium derived dominantly from serpentinite and peridotite.

Pearsoll soils are shallow to serpentinite and are well drained. The surface layer is extremely stony clay loam, and the subsoil is extremely cobbly clay.

Dubakella soils are moderately deep to serpentinite and are well drained. The surface layer is very cobbly clay loam, and the subsoil is very cobbly clay loam and extremely cobbly clay.

Eightlar soils are deep and moderately well drained. They are extremely stony clay throughout.

This unit is used for wildlife habitat, recreation, watershed, and livestock grazing.

The main limitations of this unit for most uses are the low fertility of the soils and steepness of slope. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth.

12. Cornutt-Dubakella

Deep and moderately deep, well drained cobbly clay loam and very cobbly clay loam

This map unit is mainly on mountainsides and alluvial fans throughout the county. The vegetation is mainly

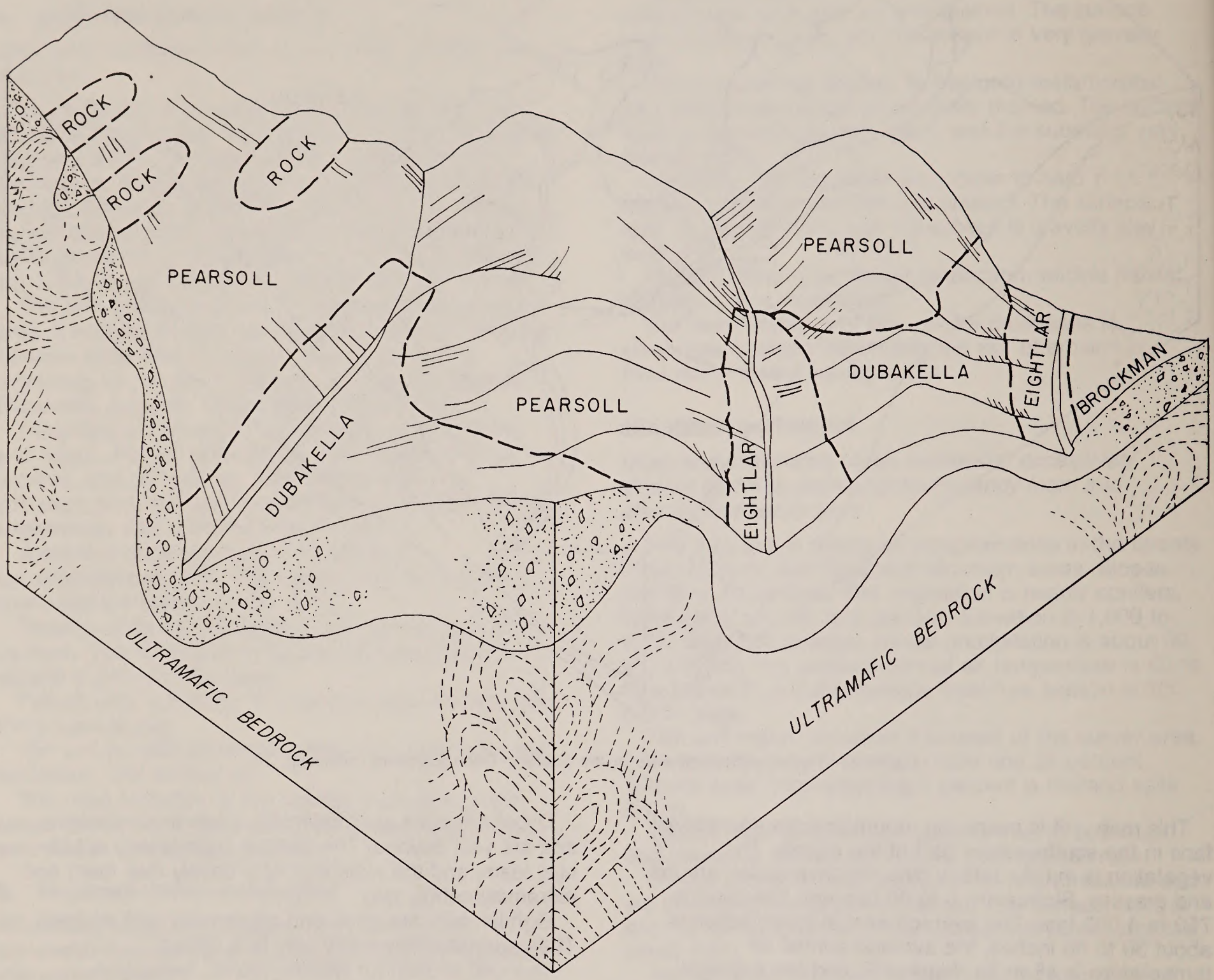


Figure 2.—Typical pattern of soils in the Pearsoll-Dubakella-Eightlar general map unit.

conifers, shrubs, and grasses. Slopes are 7 to 55 percent. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free season is 100 to 170 days.

This unit makes up about 5 percent of the survey area. It is about 40 percent Cornutt soils and 35 percent Dubakella soils. The remaining 25 percent is Brockman, Josephine, Pearsoll, and Speaker soils.

Cornutt soils are on mountainsides and alluvial fans, and Dubakella soils are on mountainsides and ridgetops. These soils formed in colluvium and residuum derived dominantly from ultramafic rock and altered sedimentary and extrusive igneous rock.

Cornutt soils are deep to metavolcanic rock. The surface layer is cobbly clay loam, and the subsoil is clay.

Dubakella soils are moderately deep to serpentinite. The surface layer is very cobbly clay loam, and the subsoil is very cobbly clay loam and extremely cobbly clay.

This unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitations of this unit for most uses are low fertility of the soils and steepness of slope. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth.

13. Jayar-Althouse

Moderately deep and deep, well drained very gravelly loam and very gravelly silt loam

This map unit is mainly on mountainsides and ridges. It is in areas that have cold soil temperatures, dominantly in the southeastern part of the county. The vegetation is mainly true firs, Douglas-fir, cedars, shrubs, and grasses. Slopes are 20 to 75 percent. Elevation is 3,600 to 5,500 feet. The average annual precipitation is 40 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is less than 100 days.

This unit makes up about 6 percent of the survey area. It is about 55 percent Jayar soils and 20 percent Althouse soils. The remaining 25 percent is Perdin and Woodseye soils and Rock outcrop.

Jayar soils are on mountainsides and ridges. Althouse soils are on mountainsides. These soils formed in colluvium and residuum dominantly from altered sedimentary and extrusive igneous rock.

Jayar soils are moderately deep to metavolcanic rock. The surface layer is very gravelly loam, and the subsoil is extremely gravelly loam.

Althouse soils are deep to metavolcanic rock. The surface layer is very gravelly silt loam, and the subsoil and substratum are extremely gravelly silt loam.

This unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitation of this unit for most uses is steepness of slope. Minimizing the risk of erosion is essential in forest management.

14. Crannler-Goodwin-Rogue

Moderately deep and deep, somewhat excessively drained and well drained very stony sandy loam and stony coarse sandy loam

This map unit is mainly on mountainsides. It is in the southeastern part of the county in areas where soil temperatures are cold. The vegetation is mainly true firs, cedars, shrubs, and grasses. Slopes are 5 to 90 percent. Elevation is 3,600 to 7,000 feet. The average annual precipitation is about 50 to 80 inches, the average annual air temperature is 38 to 45 degrees F, and the average frost-free season is less than 100 days.

This unit makes up about 3 percent of the survey area. It is about 30 percent Crannler soils, 25 percent Goodwin soils, and 15 percent Rogue soils. The remaining 30 percent is Bigelow soils, Cryaquepts, Cryumbrepts, and Rock outcrop.

The soils in this unit formed in colluvium and residuum derived dominantly from granitic rock.

Crannler soils are moderately deep to quartz-diorite and are somewhat excessively drained. The surface layer is very stony sandy loam, and the substratum is extremely stony sandy loam.

Goodwin soils are deep to quartz-diorite and are well drained. The surface layer is very stony sandy loam. The subsoil is extremely gravelly sandy loam, and the substratum is very gravelly sandy loam.

Rogue soils are deep to granodiorite and are somewhat excessively drained. The surface layer is stony coarse sandy loam. The subsoil is gravelly coarse sandy loam, and the substratum is gravelly loamy coarse sand.

This unit is used for timber production, wildlife habitat, recreation, and watershed.

The main limitation of this unit for most uses is steepness of slope. Minimizing the risk of erosion is essential in forest management.

broad land use considerations

About 7,800 acres in the survey area is urban land. In addition, many acres in the area have now been divided into small parcels for rural or recreational use. Generally, the soils in the valleys have good potential for irrigated crops as well as for community developments, such as dwellings, roads, and many other related uses. The soils on the mountains have good potential for timber production, watershed, wildlife habitat, and recreation.

In the following paragraphs information is given on the broad land use considerations for the general soil map units. This information will assist decisionmakers and enhance the general public's understanding of the kind, extent, and location of soils in the area. It will be invaluable in planning future land use patterns.

Areas of soils that are favorable for timber production are throughout the survey area, but they are most extensive in general map units 7, 8, 9, 10, 13, and 14. Steepness of slope, droughtiness, and the difficulty of reforestation are major concerns for producing and harvesting timber on the soils in these units. Potential for production of timber varies widely. Proper management practices need to be used to insure successful reforestation. Soil erosion is a severe problem when areas of these soils are disturbed. Minimum disturbance will preserve the productivity of the soils and limit sedimentation of streams and rivers, thus protecting important fish life and water quality.

Units 4 and 6 are capable of producing good stands of timber. These units are being converted from forest land to farmland and into home subdivisions. The mountainous areas of units 11 and 12 are unfavorable for timber production. Low soil fertility is the primary limitation for timber production on the soils in these units.

Areas of units 1, 2, 3, 4, and 6 are favorable for

farming. Irrigation is needed for high production of crops. Some areas of these units are limited by slope, wetness, the hazard of flooding, or rock fragments in the soil. Drainage needs to be provided for the soils in unit 3. The hazard of flooding limits the choice of crops and irrigation practices on unit 1. Some areas of unit 6 are too steep to safely cultivate. Soil erosion is a severe hazard on the granitic soils when they are disturbed. Generally, units 2 and 4 are suited to a variety of crops and cultural practices.

Areas of soils that are mostly favorable for urban or homesite development are in units 2, 4, 6, and 7. These units are mainly in valleys and on foothills. Shrinking and swelling of the soils, low soil strength, and steepness of slope can result in higher construction costs. Units 1, 3, and 5 are mostly unfavorable for community development. The hazard of flooding, low soil strength, shrinking and swelling of the soil, and wetness are limitations that must be overcome.

Areas of units 11 and 12 are used for mining. Mineral ore deposits of gold, silver, and other metals are in the rocks associated with the soils in these units. Recreation and watershed are also very important uses. The soils need to be protected from erosion if they are managed for these uses. Most areas of these units are managed by public agencies.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Pollard loam, 2 to 7 percent slopes, is one of several phases in the Pollard series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Camas-Newberg complex is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

This survey was mapped at two levels of intensity, or detail. The more detailed part is identified by narrowly defined units, and the less detailed part is identified by broadly defined units. In the narrowly defined units the soil delineation boundaries were plotted and verified at closely spaced intervals. In the broadly defined units the soil delineation boundaries were plotted and verified by some observations. The intensity of mapping was based on the anticipated long-term use of the survey, and the map units were designed to meet the needs for that use. On the soil map legend at the back of this survey, the broadly defined units are identified by an asterisk following the map unit name.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

map unit descriptions

1B—Abegg gravelly loam, 2 to 7 percent slopes. This deep, well drained soil is on high stream terraces. It formed in alluvium and colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, shrubs, forbs, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs about 1 1/2 inches thick. The surface layer is very dark grayish brown gravelly loam about 4 inches thick. The next layer is dark brown gravelly loam about 5 inches thick. The upper 7 inches of the subsoil is dark brown gravelly loam. The lower 40 inches is dark brown and dark reddish brown very gravelly and extremely gravelly clay loam and extremely gravelly loam. The substratum to a depth of 60 inches or more is variegated brown and reddish brown extremely gravelly loamy sand.

Included in this unit are about 10 percent Pollard soils and 5 percent Kerby soils on low stream terraces. Also

included are small areas of Takilma soils on low stream terraces and Manita soils on high stream terraces. The percentage of included soils varies from one area to another.

Permeability of this Abegg soil is moderate to a depth of 56 inches and moderately rapid below this depth. Available water capacity is about 4 to 6 inches. Water supplying capacity is 15 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture, homesites, and timber production. It is also used for dryland hay and pasture and for wildlife habitat.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitations are droughtiness and seepage. Crops that are tolerant of drought are best suited because the available moisture is not adequate for good growth of most other crops.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Because the soil is droughty, light and frequent applications of irrigation water are needed. These applications should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure good growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—If this unit is used for homesite development, the main limitations are moderate permeability and unstable cutbanks that are subject to raveling. Septic tank absorption fields may not function properly during rainy periods because of moderate permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for this limitation.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants. Removal of pebbles and cobbles in these areas is needed for best results when landscaping, particularly in areas used for lawns.

Recreation.—Coarse fragments in the surface layer limit this unit for some recreational uses.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 114 for Douglas-fir, the potential production per acre is 6,300 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 63,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concern in producing and harvesting timber is the difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Minimizing the risk of erosion is essential in forest management.

Tree seedlings have only a moderate rate of survival because of droughtiness. Reforestation must be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

This map unit is in capability subclasses IIIs, irrigated, and IVs, nonirrigated.

1C—Abegg gravelly loam, 7 to 12 percent slopes. This deep, well drained soil is on high stream terraces. It formed in alluvium and colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, shrubs, forbs, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs about 1 1/2 inches thick. The surface layer is very dark grayish brown gravelly loam about 4 inches thick. The next layer is dark brown gravelly loam about 5 inches thick. The upper 7 inches of the subsoil is dark brown gravelly loam. The lower 40 inches is dark brown and dark reddish brown very gravelly and extremely gravelly clay loam and extremely gravelly loam. The substratum to a depth of 60 inches or more is variegated brown and reddish brown extremely gravelly loamy sand.

Included in this unit are about 10 percent Pollard soils and 5 percent Manita soils on high stream terraces. Also included are small areas of Takilma soils on low stream

terraces. The percentage of included soils varies from one area to another.

Permeability of this Abegg soil is moderate to a depth of 56 inches and moderately rapid below this depth. Available water capacity is about 4 to 6 inches. Water supplying capacity is 15 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture, homesites, and timber production. It is also used for recreation, dryland hay and pasture, and wildlife habitat.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitations are droughtiness and steepness of slope. Crops that are tolerant of drought are best suited because the available moisture is not adequate for good growth of most other crops.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Because the soil is droughty, light and frequent applications of irrigation water are needed. These applications should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure good growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of the seepage.

Homesites.—If this unit is used for homesite development, the main limitations are moderate permeability and unstable cutbanks. Steepness of slope limits use of the steeper areas of this unit. The hazard of erosion is increased if the soil is left exposed during site development. Preserving as much of the existing plant cover as possible during construction helps to control erosion.

Septic tank absorption fields may not function properly during rainy periods because of moderate permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for this limitation. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

Recreation.—If this unit is used for recreational development, the main limitations are small stones and steepness of slope.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 114 for Douglas-fir, the potential production per acre is 6,300 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 63,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Minimizing the risk of erosion is essential in forest management.

Reforestation must be carefully managed. Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

Tree seedlings have only a moderate rate of survival because of droughtiness. If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass IVs, irrigated and nonirrigated.

1D—Abegg gravelly loam, 12 to 20 percent slopes. This deep, well drained soil is on high stream terraces. It formed in alluvium and colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, Pacific madrone, shrubs, forbs, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs about 1 1/2 inches thick. The surface layer is very dark grayish brown gravelly loam about 4 inches thick. The next layer is dark brown gravelly loam about 5 inches thick. The upper 7 inches

of the subsoil is dark brown gravelly loam. The lower 40 inches is dark brown and dark reddish brown very gravelly and extremely gravelly clay loam and extremely gravelly loam. The substratum to a depth of 60 inches or more is variegated brown and reddish brown extremely gravelly loamy sand.

Included in this unit are about 10 percent Pollard soils and 5 percent Manita soils on high stream terraces and 5 percent Josephine soils on convex slopes. The percentage of included soils varies from one area to another.

Permeability of this Abegg soil is moderate to a depth of 56 inches and moderately rapid below this depth. Available water capacity is about 4 to 6 inches. Water supplying capacity is 15 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for timber production, homesites, and irrigated hay and pasture. It is also used for dryland hay and pasture, wildlife habitat, and recreation.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 114 for Douglas-fir, the potential production per acre is 6,300 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 63,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation and steepness of slope. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

Tree seedlings have only a moderate rate of survival because of droughtiness. If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Homesites.—The main limitations for homesite development are moderate permeability and unstable cutbanks. Steepness of slope limits use of the steeper areas of the unit. The hazard of erosion is increased if the soil is left exposed during site development. Preserving as much of the existing plant cover as possible during construction helps to control erosion.

Septic tank absorption fields may not function properly during rainy periods because of moderate permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for this limitation. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and small stones.

Hay and pasture.—This unit is suited to irrigated hay and pasture. The main limitations are droughtiness and steepness of slope. Crops that are tolerant of drought are best suited because the available moisture is not adequate for good growth of other crops.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Because the soil is droughty, light and frequent applications of irrigation water are needed. These applications should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure good growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion. The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the

water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the unit from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage and steepness of slope.

This map unit is in capability subclass IVs, irrigated and nonirrigated.

2F—Althouse very gravelly silt loam, 35 to 75 percent north slopes. This deep, well drained soil is on mountainsides. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly white fir, Douglas-fir, Shasta red fir, shrubs, and grasses. Elevation is 3,600 to 5,500 feet. The average annual precipitation is about 50 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of partially decomposed needles and twigs about 1 inch thick. The surface layer is very dark grayish brown very gravelly silt loam about 3 inches thick. The subsoil is dark yellowish brown and yellowish brown extremely gravelly silt loam about 28 inches thick. The substratum is light yellowish brown extremely gravelly silt loam about 15 inches thick over weathered metavolcanic bedrock. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 15 percent Jayar soils on mountainsides and 10 percent Woodseye soils on ridges. Also included are small areas of soils that are less than 35 percent rock fragments. The percentage of included soils varies from one area to another.

Permeability of this Althouse soil is moderate. Available water capacity is about 6 to 12 inches. Water supplying capacity is 8 to 14 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, recreation, and wildlife habitat.

Woodland.—This unit is well suited to the production of Douglas-fir, Shasta red fir, and white fir. Based on a site index of 113 for Douglas-fir, the potential production per acre is 6,200 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 61,900 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in placement of culverts help to control erosion.

The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soil is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants on the soil.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of droughtiness and frost heaving. Small stones in the soil make planting difficult. Among the trees that are suitable for planting are Douglas-fir and Shasta red fir. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can kill or damage seedlings.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

3F—Althouse very gravelly silt loam, 35 to 75 percent south slopes. This deep, well drained soil is on mountainsides. It formed in colluvium and residuum dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly white fir,

Douglas-fir, Shasta red fir, shrubs, forbs, and grasses. Elevation is 3,600 to 5,500 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs about 1 inch thick. The surface layer is very dark brown very gravelly silt loam about 3 inches thick. The subsoil is brown and dark yellowish brown very gravelly silt loam about 23 inches thick. The substratum is light yellowish brown extremely gravelly silt loam about 20 inches thick over weathered metavolcanic bedrock. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 20 percent Jayar soils on mountainsides and 10 percent Woodseye soils on ridges. Also included are small areas of Rock outcrop. The percentage of inclusions varies from one area to another.

Permeability of this Althouse soil is moderate. Available water capacity is about 6 to 12 inches. Water supplying capacity is 8 to 14 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, recreation, and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir, Shasta red fir, and white fir. Based on a site index of 95 for Douglas-fir, the potential production per acre is 4,600 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 46,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soil is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants on the soil.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Small stones in the soil make planting difficult, and tree seedlings have only a moderate rate of survival because of droughtiness and frost heaving. Seedling survival can be improved by providing shade.

Among the trees that are suitable for planting are Douglas-fir and Shasta red fir. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can kill or damage seedlings.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

4—Banning loam. This deep, somewhat poorly drained soil is on alluvial fans and in drainageways. It formed in alluvium derived from metamorphic, granitic, and ultramafic rock. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly Oregon white oak, ponderosa pine, Oregon ash, shrubs, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is black loam about 6 inches thick. The next layer is black clay loam about 8 inches thick. The subsoil is very dark grayish brown clay loam about 36 inches thick. The substratum to a depth of 60 inches or more is dark grayish brown clay loam. It is underlain by bedrock.

Included in this unit are about 10 percent Wapato soils and 5 percent Selmac soils. Also included are small areas of Cove soils and other soils that are similar to this Banning soil but are redder. The percentages of included soils vary from one area to another.

Permeability of this Banning soil is moderately slow. Available water capacity is about 9 to 12 inches. Water

supplying capacity is 18 to 22 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 12 to 36 inches in winter and spring. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for irrigated hay and pasture and as homesites. A few areas are used for recreation and dryland pasture.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by wetness. Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is also needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Leveling helps to insure the uniform application of water.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit has few limitations for pond reservoir development (fig. 3).

Homesites.—If this unit is used for homesite development, the main limitations are wetness and moderately slow permeability. Because of these limitations, septic tank absorption fields can be expected to function poorly.

Drainage is needed if roads and building foundations are constructed. Wetness can be reduced by installing drain tile around footings. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Recreation.—If this unit is used for recreational development, the main limitation is wetness. Providing drainage helps to overcome this limitation.

This map unit is in capability subclass IIw, irrigated and nonirrigated.

5B—Barron coarse sandy loam, 2 to 7 percent slopes. This deep, somewhat excessively drained soil is on toe slopes and alluvial fans. It formed in colluvium and alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, California black oak, whiteleaf manzanita, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 9 inches thick. The subsoil is light olive brown coarse sandy loam about 26 inches thick. The substratum to a depth of 60 inches or more is light olive brown coarse sandy loam. It is underlain by bedrock.

Included in this unit are about 10 percent Clawson soils in depressional areas, 5 percent Jerome soils in drainageways, and 5 percent Holland soils. Also included are small areas of Siskiyou soils. The percentage of included soils varies from one area to another.

Permeability of this Barron soil is moderately rapid. Available water capacity is about 4 to 7 inches. Water supplying capacity is 10 to 14 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for recreation, dryland pasture, other adapted cultivated crops, and timber production (fig. 4).

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitations are droughtiness and the hazard of erosion. Crops that are tolerant of drought are best suited because the available moisture is not adequate for good growth of other crops.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion. Piping is a concern, however, if the unit is used for the construction of terraces, diversions, embankments, dikes, and levees.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility. Crop residue left on or near the surface

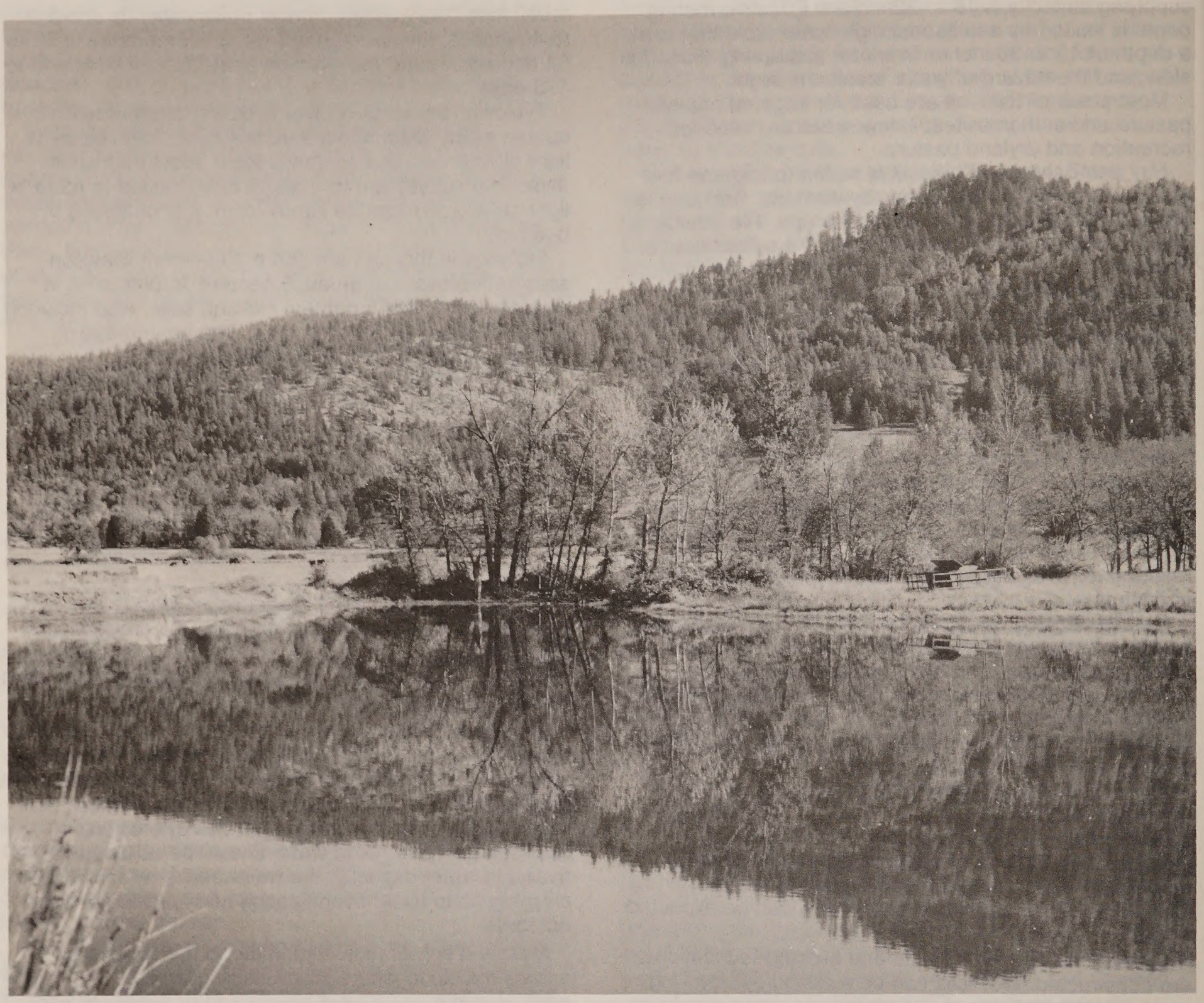


Figure 3.—Pond constructed in area of Banning loam provides water for livestock and wildlife and for irrigation.

helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds or other water impoundments because of seepage in the floor and piping in the embankment.

Homesites.—This unit is well suited to homesite development. The main limitation for sanitary facilities is the moderately rapid permeability. During the rainy season, effluent from onsite sewage disposal systems may seep in areas downslope.

Because the hazard of erosion is increased if the soil is left exposed, plans for homesite development should provide for the preservation of as many trees as possible. Preserving as much of the existing plant cover as possible during construction also helps to control erosion. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. In summer, irrigation

is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

This soil is a potential source of roadfill.

Recreation.—This unit is suited to recreational development. It is limited for playgrounds mainly by steepness of slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 110 for ponderosa pine, the potential production per acre is 4,620 cubic feet from an even-aged, fully stocked stand of trees 40 years old or 46,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 80 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Roads and landings can be protected from erosion by seeding cuts and fills. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

Tree seedlings have a low rate of survival because of the lack of adequate moisture during the growing season. If site preparation is not adequate, competition



Figure 4.—Gladiolus on Barron soils.

from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclasses IIe, irrigated, and IVe, nonirrigated.

5C—Barron coarse sandy loam, 7 to 12 percent slopes. This deep, somewhat excessively drained soil is on toe slopes and alluviai fans. It formed in colluvium and alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, California black oak, whiteleaf manzanita, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 9 inches thick. The subsoil is light olive brown coarse sandy loam about 26 inches thick. The substratum to a depth of 60 inches or more is light olive brown coarse sandy loam. It is underlain by bedrock.

Included in this unit are about 10 percent Clawson soils, 5 percent Siskiyou soils, and 5 percent Holland soils. The percentages vary from one area to another.

Permeability of Barron soil is moderately rapid. Available water capacity is about 4 to 7 inches. Water supplying capacity is 10 to 14 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is high.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for recreation, dryland pasture, cultivated crops, and timber production.

Hay and pasture.—This unit is suited to irrigated hay and pasture. The main limitations are steepness of slope, the hazard of erosion, and droughtiness. Crops that are tolerant of drought are best suited because the available moisture is not adequate for good growth of most other crops.

In summer, irrigation is also needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Limiting tillage for seedbed preparation and weed control reduces runoff and erosion. Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

Using management that maintains optimum vigor and quality of forage plants is a good practice. The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility. Fertilizer is needed to insure good growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds or other water impoundments because of seepage and steepness of slope.

Homesites.—This unit is suited to homesite development. The main limitations are seepage and steepness of slope. Structures to divert runoff are needed if buildings and roads are constructed. The hazard of erosion is increased if the soil is left exposed during site development. Therefore, plans for homesite development should provide for the preservation of as many trees and as much of the existing plant cover as possible to help to control erosion. Topsoil can be stockpiled and used to reclaim areas disturbed during construction.

This unit is a potential source of roadfill.

Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. During the rainy season, effluent from onsite sewage disposal systems may seep in areas downslope.

Recreation.—This unit is suited to recreational development. It is limited mainly by steepness of slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 110 for ponderosa pine, the potential production per acre is 4,620 cubic feet from an even-aged, fully stocked stand of trees 40 years old or 46,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 80 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Roads and landings can be

protected from erosion by constructing water bars and by seeding cuts and fills. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

Tree seedlings have a low rate of survival because of the lack of adequate moisture during the growing season. If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclasses IIIe, irrigated, and IVe, nonirrigated.

6F—Beekman-Colestine complex, 50 to 80 percent north slopes. This map unit is on mountains. The native vegetation is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 50 percent Beekman gravelly loam and 25 percent Colestine gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent Speaker and Josephine soils on ridges and in less sloping areas and 10 percent Vermisa and Witzel soils. Also included are small areas of Dubakella and Pearsoll soils and Rock outcrop. The percentage of inclusions varies from one area to another.

The Beekman soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is very dark grayish brown gravelly loam about 5 inches thick. The next layer is dark yellowish brown very gravelly loam about 9 inches thick. The subsoil is brown very gravelly loam about 11 inches thick. Fractured metamorphic bedrock is at a depth of 25 inches. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of the Beekman soil is moderate. Available water capacity is about 1 inch to 4 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Colestine soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark brown and dark yellowish brown gravelly loam about 12 inches thick. The subsoil is yellowish brown gravelly clay loam about 22 inches thick. Fractured metamorphic bedrock is at a depth of 34 inches. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of the Colestine soil is moderate. Available water capacity is about 2 to 7 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production. It is also used for recreation, watershed, and wildlife habitat.

Woodland.—The Beekman soil is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 115 for Douglas-fir, the potential production per acre is 6,360 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 57,960 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The Colestine soil is also well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 124 for Douglas-fir, the potential production per acre is 7,260 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 68,580 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber on these soils are steepness of slope, the hazard of erosion, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts. Some sloughing of the soil onto the roadway may occur.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation (fig. 5). Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soils are subject to compaction if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soils, and it restricts the growth of roots. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because

of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soils decreases seedling survival. Mulching around seedlings helps to retain moisture in summer.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIIs, nonirrigated.

7F—Beekman-Colestine complex, 50 to 75 percent south slopes. This map unit is on mountainsides. The native vegetation is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 45 percent Beekman gravelly loam and 30 percent Colestine gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent Vermisa and Witzel soils and 10 percent Speaker and Josephine soils on ridges and in less sloping areas. Also included are small areas of Dubakella soils and Rock outcrop. The

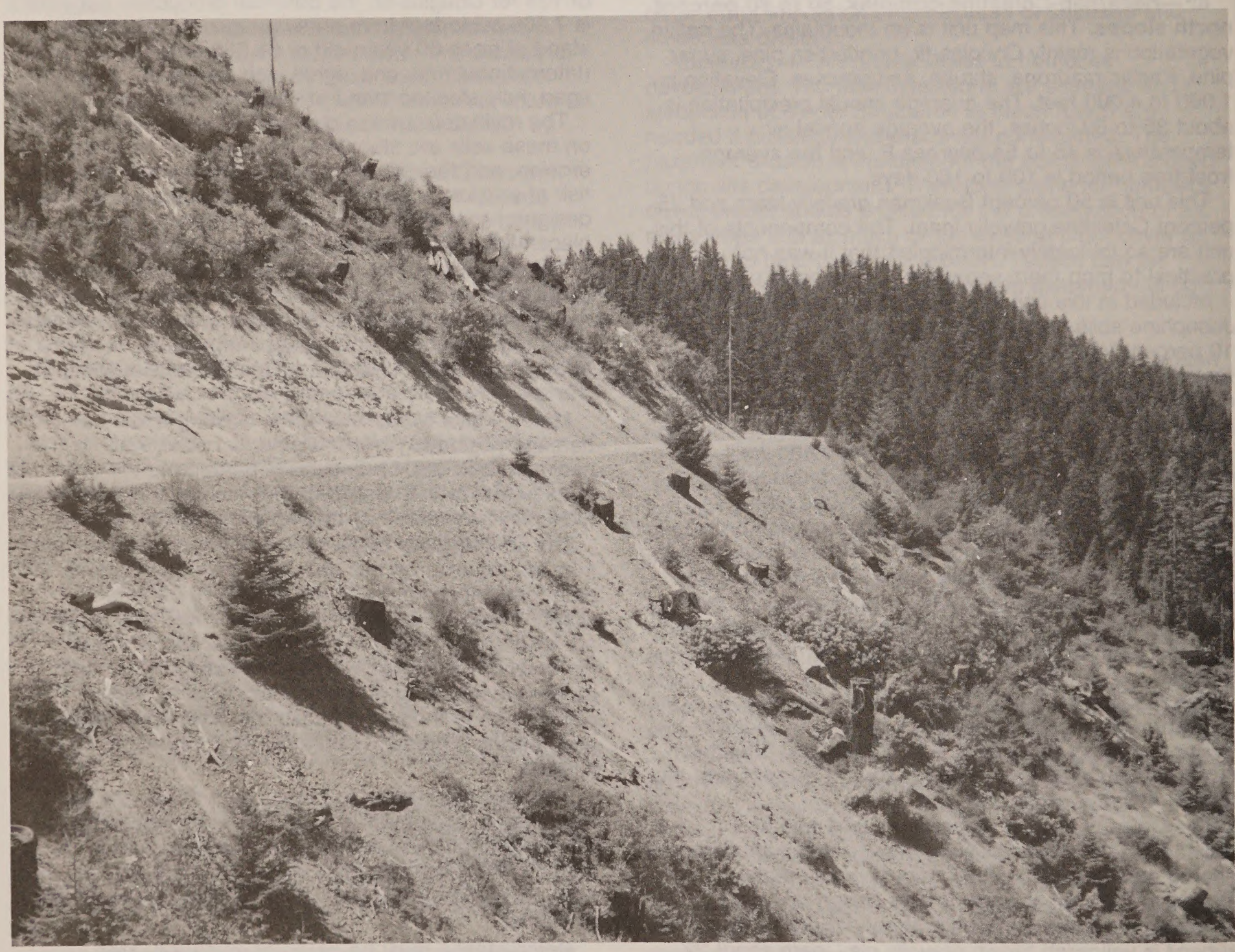


Figure 5.—Area of Beekman-Colestine complex, 50 to 80 percent north slopes.

percentage of inclusions varies from one area to another.

The Beekman soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is very dark grayish brown gravelly loam about 5 inches thick. The next layer is dark yellowish brown very gravelly loam about 9 inches thick. The subsoil is brown very gravelly loam about 11 inches thick. Fractured metamorphic bedrock is at a depth of 25 inches. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of the Beekman soil is moderate. Available water capacity is about 1 inch to 4 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Colestine soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark brown gravelly loam about 12 inches thick. The subsoil is yellowish brown gravelly clay loam about 22 inches thick. Fractured metamorphic bedrock is at a depth of 34 inches. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of the Colestine soil is moderate. Available water capacity is about 2 to 7 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production. It is also used for recreation, watershed, and wildlife habitat.

Woodland.—The Beekman soil is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 105 for Douglas-fir, the potential production per acre is 5,460 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 52,400 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The Colestine soil is also well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 110 for Douglas-fir, the potential production per acre is 5,880 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 58,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts. Some sloughing of the soil onto the roadway may occur.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soils are subject to compaction if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soils, and it restricts the growth of roots. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soils decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade for seedlings.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIIs, nonirrigated.

8G—Beekman-Vermisa complex, 60 to 100 percent north slopes. This map unit is on mountains. The soils in the unit are underlain by hard gabbro in the northwestern part of the county. The native vegetation is mainly Douglas fir, Pacific madrone, California black oak, canyon live oak, greenleaf manzanita, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 50 percent Beekman gravelly loam and 30 percent Vermisa extremely gravelly loam. The

components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Colestine soils, 5 percent Speaker and Josephine soils on ridges and in less sloping areas, and 5 percent Rock outcrop. Also included are small areas of Dubakella soils. The percentage of inclusions varies from one area to another.

The Beekman soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is very dark grayish brown gravelly loam about 5 inches thick. The next layer is dark yellowish brown very gravelly loam about 9 inches thick. The subsoil is brown very gravelly loam about 11 inches thick. Fractured metamorphic bedrock is at a depth of 25 inches. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of the Beekman soil is moderate. Available water capacity is about 1 inch to 4 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Vermisa soil is shallow and somewhat excessively drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark yellowish brown extremely gravelly loam about 3 inches thick. The subsoil is strong brown very gravelly loam about 12 inches thick. Fractured metavolcanic bedrock is at a depth of 15 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of the Vermisa soil is moderately rapid. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 10 to 12 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and recreation. It is also used for wildlife habitat and watershed.

Woodland.—The Beekman soil is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 115 for Douglas-fir, the potential production per acre is 6,360 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 57,960 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The Vermisa soil also is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 70 for Douglas-fir, the potential production per acre is 3,220 cubic feet from an even-aged, fully stocked stand of trees 70 years old or 24,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation. The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts. Some sloughing of the soil onto the roadway may occur.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soils reduces seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Trees are subject to windthrow because of limited rooting depth.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope, the hazard of erosion, and gravel on the surface. Coarse fragments in the surface layer also limit this unit for some recreational uses. Slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

9G—Beekman-Vermisa complex, 60 to 100 percent south slopes. This map unit is on mountainsides. The soils in this unit are underlain by hard gabbro in the northeastern part of the county. The native vegetation is

mainly Douglas-fir, Pacific madrone, California black oak, canyon live oak, greenleaf manzanita, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 50 percent Beekman gravelly loam and 30 percent Vermisa extremely gravelly loam. The Vermisa soil generally is on the steeper slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Rock outcrop, 5 percent Colestine soils, and 5 percent Speaker and Josephine soils on ridges and in less sloping areas. Also included are small areas of Dubakella soils. The percentage of inclusions varies from one area to another.

The Beekman soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is very dark grayish brown gravelly loam about 5 inches thick. The next layer is dark yellowish brown very gravelly loam about 9 inches thick. The subsoil is brown very gravelly loam about 11 inches thick. Fractured metamorphic bedrock is at a depth of 25 inches. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of the Beekman soil is moderate. Available water capacity is about 1 inch to 4 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Vermisa soil is shallow and somewhat excessively drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark yellowish brown extremely gravelly loam about 3 inches thick. The subsoil is strong brown very gravelly loam about 12 inches thick. Fractured metavolcanic bedrock is at a depth of 15 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of the Vermisa soil is moderately rapid. Available water capacity is about 1 inch to 2 inches. Water supplying capacity is 10 to 12 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and recreation. It is also used for wildlife habitat and watershed.

Woodland.—The Beekman soil is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 105 for Douglas-fir, the potential production per acre is 5,460 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 52,400 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The Vermisa soil is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 70 for Douglas-fir, the potential production per acre is 3,220 cubic feet from an even-aged, fully stocked stand of trees 70 years old or 24,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation. The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts. Some sloughing of the soil onto the roadway may occur.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soils decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade for seedlings.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Trees are subject to windthrow because of limited rooting depth.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope, the hazard of erosion, and gravel on the surface. Slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit

for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

10E—Bigelow very gravelly sandy loam, 5 to 35 percent slopes. This deep, well drained soil is in concave areas on mountainsides and in glacial basins. It formed in colluvium derived dominantly from granitic rock. The native vegetation is mainly white fir, Shasta red fir, shrubs, forbs, and grasses. Elevation is mainly 5,500 to 7,000 feet, but some small areas of this soil are in cold air drainageways below an elevation of 5,500 feet. The average annual precipitation is about 60 to 80 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs about 1 1/2 inches thick. The surface layer is very dark brown very gravelly sandy loam and very cobbly sandy loam about 27 inches thick. The underlying material is dark yellowish brown extremely stony sandy loam to a depth of 65 inches. It is underlain by compacted glacial till.

Included in this unit are about 10 percent Crannler soils on convex slopes, 10 percent Goodwin soils, 5 percent Rogue soils, and 5 percent Rock outcrop. The percentage of included components varies from one area to another.

Permeability of this Bigelow soil is moderate. Available water capacity is about 3 to 5 inches. Water supplying capacity is 9 to 13 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for timber production, wildlife habitat, watershed, and recreation.

Woodland.—This unit is suited to the production of white fir, Shasta red fir, and mountain hemlock. Based on a site index of 40 for Shasta red fir, the potential production per acre is 18,950 cubic feet from an even-aged, fully stocked stand of trees 140 years old or 136,000 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 140 years old.

The main concerns in producing and harvesting timber are the hazard of erosion and difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness caused by coarse fragments in the soil and frost heaving. Mulching around seedlings helps to retain moisture in summer. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Shasta red fir and white fir.

Recreation.—If this unit is used for recreational development, the main limitations are small stones and steepness of slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

10F—Bigelow very gravelly sandy loam, 35 to 65 percent slopes. This deep, well drained soil is in concave areas on mountainsides and in glacial basins. It formed in colluvium derived dominantly from granitic rock. The native vegetation is mainly white fir, Shasta red fir, shrubs, forbs, and grasses. Elevation is mainly 5,500 to 7,000 feet, but some small areas of this soil are in cold air drainageways below an elevation of 5,500 feet. The average annual precipitation is about 60 to 80 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of undecomposed needles and twigs about 1 inch thick. The surface layer is very dark brown and very dark grayish brown very gravelly sandy loam and very cobbly sandy loam about 26 inches thick. The underlying material is dark brown extremely stony sandy loam about 39 inches thick. It is underlain by compacted glacial till.

Included in this unit are about 10 percent Crannler soils on convex slopes, 10 percent Goodwin soils, 5 percent Rogue soils, and 5 percent Rock outcrop. The percentage of included components varies from one area to another.

Permeability of this Bigelow soil is moderate. Available water capacity is about 3 to 5 inches. Water supplying capacity is 9 to 13 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, wildlife habitat, watershed, and recreation.

Woodland.—This unit is suited to the production of white fir, Shasta red fir, and mountain hemlock. Based on a site index of 40 for Shasta red fir, the potential production per acre is 18,950 cubic feet from an even-aged, fully stocked stand of trees 140 years old or 136,000 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 140 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable systems that partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. The soil is subject to compaction if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness caused by coarse fragments in the soil and frost heaving. Mulching around seedlings helps to retain moisture in summer. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Shasta red fir and white fir.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and small stones. Slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

11B—Brockman clay loam, 2 to 7 percent slopes. This deep, moderately well drained soil is on alluvial fans. It formed in alluvium derived dominantly from serpentinite and peridotite. The vegetation in areas not cultivated is mainly Jeffrey pine, Douglas-fir, California black oak, whiteleaf manzanita, wedgeleaf ceanothus, and grasses. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 120 to 170 days.

Typically, the surface layer is dark reddish brown clay loam about 15 inches thick. The subsoil is reddish brown cobbly clay loam about 10 inches thick. The substratum to a depth of 60 inches or more is reddish brown cobbly clay.

Included in this unit are about 10 percent Cornutt soils, 5 percent Copsey soils, and 10 percent soils that are similar to this Brockman soil but are 40 to 60 inches deep to bedrock. Also included are small areas of Dubakella soils and soils in the east-central part of the county that are similar to the Brockman soil but contain ultramafic minerals that affect plant growth. The percentage of included soils varies from one area to another.

Permeability of this Brockman soil is very slow. Available water capacity is about 4 to 8 inches. Water supplying capacity is 11 to 16 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 24 to 36 inches in winter and spring. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for wildlife habitat and dryland pasture.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by the low fertility of the soil, steepness of slope, and very slow permeability of the substratum.

The ultramafic rock from which the soil in this unit developed is very high in content of magnesium and very low in calcium, which limits plant growth. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

The water table that develops during the rainy period in winter and spring generally limits this soil for deep-rooted crops. In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Irrigation water needs to be applied carefully to prevent the development of a high water table. Drainage may also be needed.

Homesites.—If this unit is used for homesite development, the main limitations are wetness, low soil

strength, the potential for shrinking and swelling, and very slow permeability in the substratum. Septic tank absorption fields can be expected to function poorly on this unit because of the very slow permeability and wetness.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Because a seasonal high water table is perched above the claypan, drainage should be provided for buildings with basements and crawl spaces. Wetness can be reduced by installing drain tile around footings. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclasses IIIe, irrigated, and VIe, nonirrigated.

11C—Brockman clay loam, 7 to 12 percent slopes. This deep, moderately well drained soil is on alluvial fans. It formed in alluvium derived dominantly from serpentinite. The vegetation in areas not cultivated is mainly Jeffrey pine, Douglas-fir, California black oak, whiteleaf manzanita, wedgeleaf ceanothus, and grasses. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 120 to 170 days.

Typically, the surface layer is dark reddish brown clay loam about 15 inches thick. The subsoil is reddish brown cobbly clay loam about 10 inches thick. The substratum to a depth of 60 inches or more is reddish brown cobbly clay.

Included in mapping are about 10 percent Cornutt soils, 5 percent Dubakella soils, and 10 percent soils that are similar to this Brockman soil but are 40 to 60 inches deep to bedrock. Also included are small areas of Copsey soils and soils in the east-central part of the county that are similar to this Brockman soil but contain ultramafic minerals that affect plant growth. The percentage of included soils varies from one area to another.

Permeability of this Brockman soil is very slow. Available water capacity is about 4 to 8 inches. Water supplying capacity is 11 to 16 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 24 to 36 inches in winter and spring. Runoff is medium, and the hazard of water erosion is moderate.

This soil is used mainly for irrigated hay and pasture and as homesites. It is also used for wildlife habitat and dryland pasture.

Hay and pasture.—This soil is suited to hay and pasture. It is limited mainly by low fertility, steepness of slope, and the very slow permeability of the substratum.

The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes.

The water table that develops during the rainy period in winter and spring generally limits the soil for deep-rooted crops. In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Irrigation water needs to be applied carefully to prevent the development of a high water table. Drainage may also be needed.

Seedbeds should be prepared on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion.

Homesites.—If this soil is used for homesite development, the main limitations are steepness of slope, the very slow permeability of the substratum, wetness, and the shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly because of wetness and very slow permeability.

If buildings are constructed on this soil, properly designed foundations and footings and diverting runoff away from buildings help to prevent structural damage by the shrinking and swelling of the soil. Because a seasonal high water table is perched above the claypan, drainage should be provided for buildings with a basement or crawl space. Wetness can be reduced by installing drain tile around footings. Buildings and roads should be designed to offset the limited ability of the soil to support a load. Excavation for roads and buildings increases the hazard of erosion.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

12B—Brockman cobbly clay loam, 2 to 7 percent slopes. This deep, moderately well drained soil is on

alluvial fans. It formed in cobbly alluvium derived dominantly from serpentinite. The vegetation in areas not cultivated is mainly Jeffrey pine, Douglas-fir, California black oak, whiteleaf manzanita, wedgeleaf ceanothus, and grasses. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 120 to 170 days.

Typically, the surface layer is dark reddish brown cobbly clay loam about 9 inches thick. The subsoil is dark reddish brown cobbly clay about 7 inches thick. The upper 18 inches of the substratum is reddish brown cobbly clay. The lower part to a depth of 60 inches or more is dark brown cobbly clay.

Included in this unit are about 5 percent Cornutt soils, 5 percent Dubakella soils, 5 percent Copsey soils, 5 percent Eightlar soils in the Illinois Valley aey a and 10 percent soils that are similar to this Brockman soil but are 40 to 60 inches deep to bedrock and soils in the east-central part of the county that are similar to this Brockman soil but contain ultramafic minerals that affect plant growth. The percentage of included soils varies from one area to another.

Permeability of this Brockman soil is very slow. Available water capacity is about 4 to 8 inches. Water supplying capacity is 10 to 15 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 24 to 36 inches in winter and spring. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for wildlife habitat and dryland pasture.

Hay and pasture.—This unit is suited to hay and pasture. It is limited mainly by the low fertility of the soil, steepness of slope, and the very slow permeability of the substratum. Cobbles on the surface limit the use of most equipment.

The ultramafic rock from which the soil in this unit developed is very high in content of magnesium and very low in calcium, which limits plant growth. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

The water table that develops during the rainy period in winter and spring generally limits this unit for deep-rooted crops. In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Irrigation water needs to be applied carefully to prevent the development of a high water table. Drainage may also be needed.

Homesites.—If this unit is used for homesite development, the main limitations are wetness, the very slow permeability of the substratum, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of wetness and very slow permeability.

If buildings are constructed on the soil in this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. A seasonal high water table is perched above the claypan, and drainage should be provided for buildings with basements and crawl spaces. Wetness can be reduced by installing drain tile around footings. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns. It is difficult to establish plants in areas where the surface layer has been removed. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclasses IIIs, irrigated, and VIe, nonirrigated.

12D—Brockman cobbly clay loam, 7 to 20 percent slopes. This deep, moderately well drained soil is on alluvial fans (fig. 6). It formed in cobbly alluvium derived dominantly from serpentinite. The vegetation in areas not cultivated is mainly Jeffrey pine, Douglas-fir, California black oak, whiteleaf manzanita, wedgeleaf ceanothus, and grasses. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 120 to 170 days.

Typically, the surface layer is dark reddish brown cobbly clay loam about 9 inches thick. The subsoil is dark reddish brown cobbly clay about 7 inches thick. The upper 18 inches of the substratum is reddish brown cobbly clay. The lower part to a depth of 60 inches or more is dark brown cobbly clay.

Included in this unit are about 5 percent Cornutt soils, 5 percent Dubakella soils, 5 percent Eightlar soils in the Illinois Valley area, and 10 percent soils that are similar to this Brockman soil but are 40 to 60 inches deep to bedrock. Also included are small areas of Copsey soils and soils in the east-central part of the county that are similar to this Brockman soil but contain ultramafic minerals that affect plant growth. The percentage of included soils varies from one area to another.

Permeability of this Brockman soil is very slow. Available water capacity is about 4 to 8 inches. Water supplying capacity is 10 to 15 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 24 to 36 inches in winter and spring. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for wildlife habitat.



Figure 6.—Area of Brockman cobbly clay loam, 7 to 20 percent slopes.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by the low fertility of the soil, steepness of slope, and the very slow permeability of the substratum. Cobbles on the surface limit the use of most equipment.

The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes.

The water table that develops during the rainy period in winter and spring generally limits this unit for deep-rooted crops. In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Irrigation water needs to be applied carefully to prevent the development of a high water table. Drainage may also be needed.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion.

Homesites.—If this unit is used for homesite development, the main limitations are steepness of slope, the very slow permeability of the substratum, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of wetness and the very slow permeability of the substratum.

If buildings are constructed on the soil in this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. A seasonal high water table is perched above the claypan, and drainage should be provided for buildings with basements and crawl spaces. Wetness can be reduced by installing drain tile around footings. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. Excavation for roads and buildings increases the hazard of erosion.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. Removal of pebbles and cobbles in disturbed

areas is needed for best results when landscaping, particularly in areas used for lawns. It is difficult to establish plants in areas where the surface layer has been removed. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

13—Brockman Variant very gravelly loam. This deep, well drained soil is on high stream terraces. It formed in alluvium derived dominantly from serpentinite and peridotite. Slope is 0 to 3 percent. The vegetation is mainly Douglas-fir, Jeffrey pine, sugar pine, incense-cedar, tanoak, whiteleaf manzanita, California buckthorn, and poison-oak. Elevation is 1,400 to 1,600 feet. The average annual precipitation is about 50 to 60 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark reddish brown very gravelly loam about 12 inches thick. The upper 23 inches of the subsoil is yellowish red, dark reddish brown, and strong brown gravelly clay loam and gravelly loam. The lower part to a depth of 60 inches or more is dark brown very gravelly loam.

Included in this unit are about 5 percent Eightlar soils and 10 percent soils that are similar to this Brockman Variant soil but are more than 35 percent rock fragments. Also included are small areas of Copsey soils. The percentage of included soils varies from one area to another.

Permeability of this Brockman Variant soil is moderate. Available water capacity is about 6.5 to 10.5 inches. Water supplying capacity is 18 to 23 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly as homesites and for timber production. It is also used for wildlife habitat.

Homesites.—If this unit is used for homesite development, the main limitations are moderate permeability and the potential for shrinking and swelling of the soil. Septic tank absorption fields do not function properly during rainy periods because of moderate permeability. Use of sandy backfill for the trenches and long absorption lines helps to compensate for this limitation.

The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns. It is difficult to establish plants in areas where the surface layer has been removed. Mulching and fertilizing cut areas help to establish plants.

Woodland.—This unit is suited to the production of Douglas-fir, Jeffrey pine, sugar pine, and incense-cedar. Based on a site index of 95 for Douglas-fir, the potential production per acre is 4,620 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 46,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of the low fertility of the soil and lack of adequate moisture during the growing season. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. Soil compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Droughtiness caused by coarse fragments in the soil decreases seedling survival. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, Jeffrey pine, sugar pine, and incense-cedar.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass IVs, nonirrigated.

14—Camas gravelly sandy loam. This deep, excessively drained soil is on flood plains. It formed in alluvium derived dominantly from granitic rock and altered sedimentary and extrusive rock. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly Oregon ash, cottonwood, ponderosa pine, shrubs, and grasses. Elevation is 750 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 150 to 170 days.

Typically, the surface layer is very dark grayish brown gravelly sandy loam about 10 inches thick. The underlying material to a depth of 60 inches or more is

variegated, mostly brown, dark brown, and dark grayish brown very gravelly sand.

Included in this unit are about 10 percent Newberg soils, 5 percent Evans soils, and 10 percent Riverwash. Also included are small areas of Takilma soils on low stream terraces that are not subject to flooding. The percentage of included components varies from one area to another.

Permeability of this Camas soil is very rapid. Available water capacity is about 1.5 to 3.5 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 12 to 24 inches. Roots are restricted by the very gravelly sand below this depth. Runoff is slow, and the hazard of water erosion is moderate. This soil is subject to occasional, brief periods of flooding in winter and spring. Channeling and deposition are common along streambanks.

This unit is used mainly for irrigated hay and pasture and for wildlife habitat. It is also used for recreation and homesite development.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by droughtiness and the hazard of flooding. The risk of flooding can be reduced by the use of embankments, dikes, and levees. Seeding early in fall and construction of diversions and grassed waterways help to control erosion.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Flooding can be controlled only by use of major flood control structures, which should be located above the expected flood level.

Recreation.—This unit is suited to recreational development. It is limited mainly by the hazard of flooding and small stones. The risk of flooding limits the use of this unit mainly to picnic areas, playgrounds, paths, and trails.

This map unit is in capability subclass IVw, irrigated and nonirrigated.

15—Camas-Newberg complex. This map unit is on flood plains. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly Oregon ash, cottonwood, ponderosa pine, shrubs, and grasses. Elevation is 750 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 150 to 170 days.

This unit is 45 percent Camas gravelly sandy loam and 35 percent Newberg fine sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Evans soils and 10 percent Riverwash. Also included are small areas of soils, in depressional areas, that are similar to the Newberg soil but are somewhat poorly drained. The percentage of included components varies from one area to another.

The Camas soil is deep and excessively drained. It formed in alluvium derived dominantly from granitic rock and altered sedimentary and extrusive igneous rock. Typically, the surface layer is very dark grayish brown gravelly sandy loam about 10 inches thick. The underlying material to a depth of 60 inches or more is variegated, mostly brown, dark brown, and dark grayish brown very gravelly sand.

Permeability of this Camas soil is very rapid. Available water capacity is about 1.5 to 3.5 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 12 to 24 inches. Roots are restricted by the very gravelly sand below this depth. Runoff is slow, and the hazard of water erosion is moderate. This soil is subject to occasional, brief periods of flooding in winter and spring. Channeling and deposition are common along streambanks.

The Newberg soil is deep and somewhat excessively drained. It formed in alluvium derived dominantly from granitic rock and altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark brown fine sandy loam about 15 inches thick. The underlying material to a depth of 61 inches is dark yellowish brown sandy loam stratified with loamy sand and loamy fine sand stratified with fine sandy loam.

Permeability of the Newberg soil is moderately rapid to a depth of 24 inches and rapid below this depth. Available water capacity is about 5 to 8 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. This soil is subject to occasional, brief periods of flooding in winter and spring. Channeling and deposition are common along streambanks.

This unit is used mainly for irrigated hay and pasture and for wildlife habitat. It is also used for recreation and homesite development.

Hay and pasture.—This unit is suited to irrigated pasture and hay crops. It is limited mainly by the hazard of flooding and droughtiness. The risk of flooding can be reduced by the use of embankments, dikes, and levees. Seeding early in fall and construction of diversions and grassed waterways help to control erosion.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soils from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Flooding can be controlled only by use of major flood control structures, which should be located above the expected flood level.

Recreation.—This unit is suited to recreational development. It is limited mainly by the hazard of flooding and small stones. The risk of flooding limits the use of this unit mainly to picnic areas, playgrounds, paths, and trails.

This map unit is in capability subclass IVw, irrigated and nonirrigated.

16—Central Point sandy loam. This deep, well drained soil is on low stream terraces and alluvial fans. It formed in alluvium derived dominantly from granitic and metamorphic rock. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly native grasses, Oregon white oak, Douglas-fir, and ponderosa pine. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark grayish brown and dark brown sandy loam about 15 inches thick. The subsoil is dark brown sandy loam about 21 inches thick. The substratum to a depth of 60 inches or more is dark brown gravelly sandy loam.

Included in this unit is about 10 percent Kerby and Foehlin soils on low stream terraces. Also included are small areas of Takilma soils and soils on or near flood plains. The percentage of included soils varies from one area to another.

Permeability of this Central Point soil is moderately rapid. Available water capacity is about 4.5 to 7.5 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. A seasonal high water table is at a depth of 48 to 72 inches in winter.

Most areas of this unit are used for irrigated hay and pasture and as homesites. A few areas are used for recreation, wildlife habitat, and dryland pasture.

Hay and pasture.—This unit has few limitations for irrigated hay and pasture and for other cultivated crops. Piping is a concern if the soil in this unit is used for embankments, dikes, and levees.

In summer, irrigation is needed for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Leveling helps to insure the uniform application of water.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—This unit is suited to homesite development. The main limitations are wetness and the hazard of cutbanks caving in. Septic tank absorption fields may not function properly during rainy periods because of wetness.

Drainage may be needed if roads and building foundations are constructed. Wetness can be reduced by installing drain tile around footings.

This unit is a good source of roadfill.

Recreation.—This unit is well suited to recreational development. It has few limitations.

This map unit is in capability subclasses IIs, irrigated, and IVc, nonirrigated.

17B—Clawson sandy loam, 2 to 7 percent slopes. This deep, somewhat poorly drained soil is on alluvial fans and in drainageways. It formed in alluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly sedges, grasses, and willows. Elevation is 800 to 2,000 feet. The average annual

precipitation is about 30 to 40 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark grayish brown sandy loam about 3 inches thick. The subsoil is dark grayish brown and grayish brown sandy loam about 13 inches thick. The substratum to a depth of 60 inches or more is light brownish gray and pale brown sandy loam and coarse sandy loam.

Included in this unit are about 10 percent Jerome soils, 5 percent Barron soils, and 10 percent soils that are similar to this Clawson soil but that are more than 18 percent clay. The percentage of included soils varies from one area to another.

Permeability of the Clawson soil is moderately rapid. Available water capacity is about 5.5 to 7.5 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 12 to 36 inches from late in fall to spring. Runoff is slow, and the hazard of water erosion is moderate.

Most areas of this unit are used for irrigated hay and pasture and as homesites. A few areas are used for recreation, dryland pasture, and cultivated crops.

Hay and pasture.—This unit is suited to hay and pasture. The main limitations are wetness and slope. Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available. Piping is a concern if the soil in this unit is used for embankments, dikes, or levees.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Leveling helps to insure the uniform application of water.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways also help to control erosion.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitation is wetness. Septic tank absorption fields can be expected to function poorly on this unit because of this limitation.

Drainage is needed if roads and building foundations are constructed. Wetness can be reduced by installing drain tile around footings.

This unit is a fair source of topsoil.

Recreation.—If this unit is used for recreational development, the main limitation is wetness. Drainage should be provided for paths and trails. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass IIIw, irrigated and nonirrigated.

18A—Copsey clay, 0 to 3 percent slopes. This deep, poorly drained soil is in drainageways. It formed in alluvium derived dominantly from serpentinite or peridotite. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is black clay about 18 inches thick. The next layer, to a depth of 40 inches, is very dark brown gravelly clay. The underlying material to a depth of 60 inches or more is very dark grayish brown gravelly light clay.

Included in this unit are about 10 percent Brockman soils on alluvial fans and 5 percent Cove soils in drainageways. The percentage of included soils varies from one area to another.

Permeability of this Copsey soil is very slow. Available water capacity is about 5.5 to 8.5 inches. Water supplying capacity is 15 to 18 inches. Effective rooting depth is limited by a seasonal water table that is at a depth of 6 to 18 inches in winter and spring. This soil is subject to rare periods of flooding. Runoff is very slow, and the hazard of water erosion is slight.

This unit is used for irrigated pasture and hay and for homesite development. It is also used for recreational development and wildlife habitat.

Hay and pasture.—The present vegetation in most areas is mainly sedges, rushes, and grasses. The production of forage for livestock is limited by low fertility. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

If this unit is used for irrigated hay and pasture, the main limitations are the low fertility of the soil, wetness, and the very slow permeability. Drainage is needed for

maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—This unit is poorly suited to homesite development. The main limitations are low soil strength, wetness, rare periods of flooding, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of the very slow permeability and the seasonal high water table.

Drainage is needed if roads and building foundations are constructed. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Recreation.—If this unit is used for recreational development, the main limitations are excessive wetness, very slow permeability, and the clayey surface layer. Drainage should be provided.

This map unit is in capability subclasses IIIw, irrigated, and IVw, nonirrigated.

18B—Copsey clay, 3 to 7 percent slopes. This deep, poorly drained soil is in drainageways. It formed in alluvium derived dominantly from serpentinite or peridotite. Elevation is 800 to 2,500 feet. The average annual precipitation is 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is black clay about 18 inches thick. The next layer, to a depth of 40 inches, is very dark brown gravelly clay. The underlying material, to a depth of 60 inches or more, is very dark grayish brown gravelly light clay.

Included in mapping are about 10 percent Brockman soils on alluvial fans and 5 percent Cove soils. The percentage of included soils varies from one area to another.

Permeability of this Copsey soil is very slow. Available water capacity is about 5.5 to 8.5 inches. Water supplying capacity is 15 to 18 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 6 to 18 inches in winter and spring. This soil is subject to rare periods of flooding. Runoff is medium, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture and for homesite development. It is also used for recreational development and wildlife habitat.

Hay and pasture.—The present vegetation in most areas is mainly sedges, rushes, and grasses. The production of vegetation is limited by the low fertility of the soil. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

If this unit is used for irrigated hay and pasture, the main limitations are the iow fertility of the soil, excessive wetness, and very slow permeability. Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. All tillage should be on the contour or across the slope. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—This unit is poorly suited to homesite development. The main limitations are low soil strength, excessive wetness, rare periods of flooding, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit. Drainage is needed if roads and building foundations are constructed.

The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Recreation.—If this unit is used for recreational development, the main limitations are excessive wetness, very slow permeability, and the clayey surface layer. Drainage should be provided.

This map unit is in capability subclasses IIIw, irrigated, and IVw, nonirrigated.

19D—Cornutt-Dubakella complex, 7 to 20 percent slopes. This map unit is on mountains, ridgetops, and alluvial fans. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 65 percent Cornutt cobbly clay loam and 25 percent Dubakella very cobbly clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Pollard soils and 5 percent Brockman soils. The percentage of included soils varies from one area to another.

The Cornutt soil is deep and well drained. It formed in colluvium and alluvium derived dominantly from mixed ultramafic rock and altered sedimentary and extrusive igneous rock. Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark reddish brown cobbly clay loam about 11 inches thick. The subsoil is dark red clay about 30 inches thick. Metavolcanic bedrock is at a depth of 41 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Cornutt soil is slow. Available water capacity is about 4 to 8.5 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Dubakella soil is moderately deep and well drained. It formed in colluvium derived dominantly from ultramafic rock. Typically, the surface layer is dark brown very cobbly clay loam about 2 inches thick. The upper 5 inches of the subsoil is dark brown extremely cobbly clay loam. The lower 11 inches is dark brown and strong brown very cobbly clay. Serpentine bedrock is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Dubakella soil is slow. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and dryland hay and pasture. It is also used for homesite development, recreation, and wildlife habitat.

The present vegetation in most areas is mainly Douglas-fir, ponderosa pine, Jeffrey pine, Pacific madrone, shrubs, and grasses. The ultramafic rock from which the soils in this unit developed is very high in content of magnesium and very low in calcium, which limits plant growth. Plants generally are more productive and abundant on the Cornutt soil, because it is influenced less by the ultramafic rock.

Woodland.—The Cornutt soil is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 97 for Douglas-fir, the potential production per acre is 4,740 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 48,180 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

Most woodland areas of the Dubakella soil are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soils may be compacted if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants. Soil compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction.

The soils in this unit are subject to landsliding and slumping because they are underlain by highly fractured bedrock and are very plastic. Roads for year-round use need heavy base rock. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival on the Cornutt soil and a low rate of survival on the Dubakella soil because of low fertility and a lack of adequate moisture during the growing season. Mulching around seedlings helps to retain moisture in summer. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, Jeffrey pine, and incense-cedar.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Hay and pasture.—If this unit is used for dryland hay and pasture, the main limitations are the low fertility of the soils, lack of adequate moisture during the growing season, and the hazard of erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soils from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth. Fertilizer is needed to insure optimum growth of grasses and legumes.

Homesites.—If this unit is used for homesite development, the main limitations are the potential for shrinking and swelling of the soils and depth to bedrock. Septic tank absorption fields can be expected to function poorly on this unit because of slow permeability.

The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soils to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Excavation for roads and buildings increases the hazard of erosion. Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens.

Recreation.—If this unit is used for recreational development, the main limitations are stones and steepness of slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIe, nonirrigated.

19E—Cornutt-Dubakella complex, 20 to 35 percent slopes. This map unit is on mountains. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 50 percent Cornutt cobbly clay loam and 30 percent Dubakella very cobbly clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Josephine and Pollard soils on mountainsides and 10 percent Brockman soils on alluvial fans. The percentage of included soils varies from one area to another.

The Cornutt soil is deep and well drained. It formed in colluvium derived dominantly from mixed ultramafic rock and altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark reddish brown cobbly clay loam about 6 inches thick. The next layer is reddish brown cobbly clay loam about 5 inches thick. The subsoil is dark red cobbly clay about 30 inches thick. Metavolcanic bedrock is at a depth of 41 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Cornutt soil is slow. Available water capacity is about 4 to 8.5 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Dubakella soil is moderately deep and well drained. It formed in colluvium derived from serpentinite and peridotite. Typically, the surface layer is dark brown very cobbly clay loam about 7 inches thick. The upper 5 inches of the subsoil is dark brown very cobbly clay loam. The lower 16 inches is dark brown and strong brown extremely cobbly clay. Serpentine bedrock is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of this Dubakella soil is slow. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and for dryland hay and pasture. It is also used for watershed, wildlife habitat, homesite development, and recreation.

The present vegetation in most areas is mainly Douglas-fir, ponderosa pine, Jeffrey pine, Pacific madrone, shrubs, and grasses. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth. Plants generally are more productive and abundant on the Cornutt soil, because it is influenced less by the ultramafic rock.

Woodland.—The Cornutt soil is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 97 for Douglas-fir, the potential production per acre is 4,740 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 48,180 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

Most woodland areas of the Dubakella soil are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soils may be compacted if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soils, and it restricts the growth of roots. Soil compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants.

The soils in this unit are subject to landsliding and slumping because they are underlain by highly fractured bedrock and are very plastic. Roads for year-round use need heavy base rock. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival on the Cornutt soil and a low rate of survival on the Dubakella soil because of the low fertility of the soils and lack of adequate moisture during the growing season. Mulching around seedlings helps to retain moisture in summer. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, Jeffrey pine, and incense-cedar.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or

artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Hay and pasture.—If this unit is used for dryland hay and pasture, the main limitations are the low fertility of the soils, the hazard of erosion, and the lack of adequate moisture during the growing season. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soils from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth. Fertilizer is needed to insure optimum growth of grasses and legumes.

Homesites.—If this unit is used for homesite development, the main limitations are steepness of slope and the potential for shrinking and swelling of the soils. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing.

The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soils to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Excavation for roads and buildings increases the hazard of erosion. Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIe, nonirrigated.

20F—Cornutt-Dubakella complex, 35 to 55 percent north slopes. This map unit is on mountains. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 40 percent Cornutt cobbly clay loam and 30 percent Dubakella very cobbly clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent Josephine soils, 10 percent Pollard soils, and 5 percent Speaker soils. Also included are small areas of Pearsoll soils and soils that are cooler than the Cornutt and Dubakella soils. The percentage of included soils varies from one area to another.

The Cornutt soil is deep and well drained. It formed in colluvium derived dominantly from mixed ultramafic rock and altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark reddish brown cobbly clay loam about 4 inches thick. The next layer is dark reddish brown cobbly clay loam about 7 inches thick. The subsoil is red clay and cobbly clay about 30 inches thick. It is underlain by metavolcanic bedrock at a depth of 41 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Cornutt soil is slow. Available water capacity is about 4 to 8.5 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

The Dubakella soil is moderately deep and well drained. It formed in colluvium derived dominantly from serpentinite and peridotite. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark reddish brown very cobbly clay loam about 7 inches thick. The subsoil is reddish brown and dark brown very cobbly clay loam and extremely cobbly clay about 21 inches thick. Serpentine bedrock is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of this Dubakella soil is slow. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, recreation, and wildlife habitat.

The present vegetation in most areas is mainly Douglas-fir, ponderosa pine, Jeffrey pine, Pacific madrone, shrubs, and grasses. The ultramafic rock from which the soils in this unit developed is very high in content of magnesium and very low in calcium, which limits plant growth. Plants generally are more productive and abundant on the Cornutt soil because it is influenced less by the ultramafic rock.

Woodland.—The Cornutt soil is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 97 for Douglas-fir, the potential production per acre is 4,740 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 48,180 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

Most woodland areas of the Dubakella soil are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and

difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

The soils in this unit are subject to landsliding and slumping because they are underlain by highly fractured bedrock and are very plastic. Roads for year-round use need heavy base rock.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soils are subject to compaction if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soils, and it restricts the growth of roots. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival on the Cornutt soil and a low rate of survival on the Dubakella soil because of the low fertility of the soils and lack of adequate moisture during the growing season. Mulching around seedlings helps to retain moisture in summer. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, incense-cedar, and Jeffrey pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

21F—Cornutt-Dubakella complex, 35 to 55 percent south slopes. This map unit is on mountains. Elevation is 1,000 to 4,000 feet. The average annual precipitation is 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 40 percent Cornutt cobbly clay loam and 35 percent Dubakella very cobbly clay loam. The components are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent Speaker soils and 10 percent Josephine soils. Also included are small areas of Pearsoll and Pollard soils and soils that are cooler than the Cornutt and Dubakella soils. The percentage of included soils varies from one area to another.

The Cornutt soil is deep and well drained. It formed in colluvium derived dominantly from mixed ultramafic rock and altered sedimentary and extrusive igneous rock. Typically, the surface is covered with a mat of partially decomposed needles and leaves about 1/2 inch thick. The surface layer is dark reddish brown cobbly clay loam about 5 inches thick. The next layer is dark reddish brown cobbly clay loam about 6 inches thick. The subsoil is dark red and dark reddish brown clay about 30 inches thick. It is underlain by weathered metavolcanic rock at a depth of 41 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Cornutt soil is slow. Available water capacity is about 4 to 8.5 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

The Dubakella soil is moderately deep and well drained. It formed in colluvium and residuum derived dominantly from serpentinite and peridotite. Typically, the surface layer is dark yellowish brown very cobbly clay loam about 2 inches thick. The next layer is dark reddish brown very cobbly clay loam about 5 inches thick. The upper 9 inches of the subsoil is dark reddish brown very cobbly clay loam. The lower 12 inches is dark reddish brown extremely cobbly clay. Serpentine bedrock is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Dubakella soil is slow. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production, watershed, recreation, and wildlife habitat.

The present vegetation in most areas is mainly Douglas-fir, ponderosa pine, Jeffrey pine, Pacific madrone, shrubs, and grasses. The ultramafic rock from which the soils in this unit developed is very high in content of magnesium and very low in calcium, which limits plant growth. Plants generally are more productive and abundant on the Cornutt soil because it is influenced less by the ultramafic rock.

Woodland.—The Cornutt soil is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 90 for Douglas fir, the potential production per acre is 4,200 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 41,030 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

Most woodland areas of the Dubakella soil are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

The soils in this unit are subject to landsliding and slumping because they are underlain by highly fractured bedrock and are very plastic. Roads for year-round use need heavy base rock.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. The soils are subject to compaction if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soils, and it restricts the growth of roots. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival on the Cornutt soil and a low rate of survival on the Dubakella soil because of the low fertility of the soils and lack of adequate moisture during the growing season. Seedling survival can be improved by providing shade for seedlings. Mulching around seedlings helps to retain moisture in summer. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, incense-cedar, and Jeffrey pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Receation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

22—Cove silty clay loam. This deep, poorly drained soil is on bottom lands and in basinlike areas. It formed in alluvium derived dominantly from altered sedimentary and extrusive igneous rock. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly sedges, rushes, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 50 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark gray silty clay loam about 8 inches thick. The subsoil is very dark gray and dark grayish brown silty clay about 34 inches thick. The substratum to a depth of 60 inches or more is dark grayish brown and dark gray silty clay.

Included in this unit are about 10 percent Wapato soils and 5 percent Jerome soils. Also included are small areas of Cove soils that have a gravelly surface layer. The percentage of included soils varies from one area to another.

Permeability of this Cove soil is very slow. Available water capacity is about 4 to 5.5 inches. Water supplying capacity is 15 to 18 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 0 to 12 inches in winter and spring. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to common, brief periods of flooding in winter and spring.

This unit is used mainly for irrigated hay and pasture. It is also used for homesite development and recreation.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by the hazard of flooding, excessive wetness, and the very slow permeability of the subsoil. Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion. The risk of flooding can be reduced by the use of embankments, dikes, and levees. Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Because of the very slow permeability of the soil, the application of water should be regulated so that water does not stand on the surface and damage the crops. Leveling helps to insure the uniform application of water.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Flooding can be controlled only by use of major flood control structures, which should be located above the expected flood level. Roads and streets can be built if they are designed to compensate for the instability of the subsoil.

Recreation.—This unit is poorly suited to recreational development because of excessive wetness, very slow permeability, and the hazard of flooding. The risk of flooding limits the use of the unit mainly to picnic areas, playgrounds, and paths and trails. Drainage should be provided for paths and trails, and protection from flooding is needed.

This map unit is in capability subclass IIIw, irrigated and nonirrigated.

23G—Crannler very stony sandy loam, 50 to 90 percent slopes. This moderately deep, somewhat excessively drained soil is on convex slopes of mountains. It formed in colluvium and residuum derived dominantly from granitic rock. The native vegetation is mainly white fir, Shasta red fir, mountain hemlock, shrubs, and grasses. Elevation is 5,500 to 7,000 feet. The average annual precipitation is about 60 to 80 inches, the average annual air temperature is 38 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface layer is very dark brown very stony sandy loam about 4 inches thick. The underlying material is very dark grayish brown and dark brown extremely stony sandy loam about 28 inches thick. It is underlain by fractured quartz-diorite. Depth to hard bedrock ranges from 20 to 40 inches.

Included in this unit are about 5 percent Goodwin soils, 5 percent Rogue soils, 10 percent Bigelow soils, 5 percent Rock outcrop, and 5 percent Cryumbrepts and Cryaquepts. The percentage of included components varies from one area to another.

Permeability of this Crannler soil is moderately rapid. Available water capacity is about 0.5 inch to 1.5 inches. Water supplying capacity is 6 to 11 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, recreation, and wildlife habitat.

Woodland.—This unit is poorly suited to the production of white fir, Shasta red fir, and mountain hemlock. Based on a site index of 30 for Shasta red fir, the potential production per acre is 14,550 cubic feet from an even-aged, fully stocked stand of trees 140 years old or 108,000 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 150 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

The steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil, thus leaving a greater number of rock fragments on the surface.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of frost heaving and lack of adequate moisture during the growing season.

Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. In areas on south-facing slopes that are droughty in summer, seedling survival can be improved by providing shade for seedlings.

Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are white fir and Shasta red fir.

Trees are subject to windthrow because of limited rooting depth.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and large stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer limit the soil in this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

24G—Crannler-Rock outcrop complex, 50 to 100 percent slopes. This map unit is on mountains and ridges. Elevation is 5,500 to 7,000 feet. The average annual precipitation is about 60 to 80 inches, the average annual air temperature is 38 to 45 degrees F, and the average frost-free period is less than 100 days.

This unit is 50 percent Crannler very stony sandy loam and 30 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Bigelow soils, 5 percent Goodwin soils, and 10 percent Cryumbrepts. The percentage of included soils varies from one area to another.

The Crannler soil is moderately deep and somewhat excessively drained. It formed in colluvium and residuum derived dominantly from granitic rock. Typically, the surface is covered with a mat of undecomposed conifer needles about 2 1/2 inches thick. The surface layer is very dark brown very stony sandy loam about 4 inches thick. The underlying material is very dark grayish brown and dark brown extremely stony sandy loam about 28 inches thick. It is underlain by fractured quartz-diorite. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of this Crannler soil is moderately rapid. Available water capacity is about 0.5 inch to 1.5 inches. Water supplying capacity is 6 to 11 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

Rock outcrop consists of areas of exposed bedrock. Runoff from these areas is very rapid.

This unit is used for livestock grazing, recreation, wildlife habitat, and watershed.

Livestock grazing.—The present vegetation in most areas is mainly white fir, Shasta red fir, mountain hemlock, shrubs, and grasses. The production of vegetation is limited by the short growing season. If this unit is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Livestock grazing should also be managed to protect the unit from excessive erosion. Steepness of slope limits access by livestock and promotes overgrazing of the less sloping areas. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Use of mechanical treatment practices is not practical, because the surface is stony and the slopes are steep.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and large stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIIs, nonirrigated.

25E—Cryaquepts, 0 to 30 percent slopes. These moderately deep or deep, somewhat poorly drained or poorly drained soils are in depressional areas, in drainage basins, and on mountainsides. The soils formed in alluvium and colluvium derived dominantly from granitic rock. The native vegetation is mainly sedges, rushes, grasses, forbs, willows, and alder. Elevation is 5,500 to 7,000 feet. The average annual precipitation is about 60 to 80 inches, the average annual air temperature is 38 to 44 degrees F, and the frost-free season is less than 100 days.

In a reference profile, the surface layer is very dark brown silt loam about 18 inches thick. The underlying material to a depth of 60 inches or more is very dark brown silt loam, gravelly silt loam, and very gravelly loam. Depth to bedrock ranges from 20 to 60 inches or more.

Included in this unit are about 5 percent Crannler soils and 5 percent Bigelow soils in the higher positions on the landscape. Also included are small fields of boulders and small areas of talus.

This unit is used for wildlife habitat, recreation, watershed, and grazing.

Recreation.—If this unit is used for recreational development, the main limitation is wetness. Good drainage should be provided for paths and trails. Erosion and sedimentation can be controlled and the beauty of the area enhanced by providing adequate plant cover.

Livestock grazing.—Livestock grazing on this unit should be managed to protect the soils from excessive erosion. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This map unit is in capability subclass VIIw.

26F—Cryumbrepts, very steep. These well drained and somewhat excessively drained, very shallow to moderately deep soils are on mountainsides. The soils

formed in colluvium derived dominantly from granitic rock. Slope is 20 to 75 percent. The native vegetation is mainly shrubs, forbs, and grasses. Elevation is 5,500 to 7,000 feet. The average annual precipitation is about 60 to 80 inches, the average annual air temperature is 38 to 44 degrees F, and the frost-free season is less than 100 days.

In a reference profile, the surface layer is dark brown gravelly sandy loam about 2 inches thick. The subsoil is dark brown gravelly sandy loam about 10 inches thick. The substratum is dark brown very gravelly sandy loam about 13 inches thick. Hard granite is at a depth of 25 inches. Depth to bedrock ranges from 7 to 40 inches.

Included in this unit are about 10 percent Rock outcrop and 5 percent Crannler soils. Also included are small fields of boulders and small areas of talus.

This unit is used for wildlife habitat, recreation, watershed, and livestock grazing.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Livestock grazing.—Livestock grazing on this unit should be managed to protect the soils from excessive erosion. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing.

This map unit is in capability subclass VIIs.

27C—Debenger loam, 7 to 12 percent slopes. This moderately deep, well drained soil is on hills and alluvial fans. It formed in colluvium and alluvium derived dominantly from sedimentary rock. The vegetation in areas not cultivated is mainly ponderosa pine, white oak, shrubs, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 46 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark grayish brown loam about 11 inches thick. The subsoil is dark brown loam about 17 inches thick and is underlain by saprolite derived from metasedimentary rock. Depth to weathered bedrock ranges from 20 to 40 inches.

Included in this unit are about 10 percent Selmac soils in drainage basins, 5 percent Holland soils, and 5 percent Ruch soils. The percentage of included soils varies from one area to another.

Permeability of this Debenger soil is moderate. Available water capacity is about 3 to 8 inches. Water supplying capacity is 14 to 19 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture and for homesite development. It is also used for recreation.

Hay and pasture.—This unit is suited to irrigated hay and pasture. The main limitations are limited rooting depth and steepness of slope.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion.

Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

The unit is limited for livestock watering ponds and other water impoundments because of steepness of slope.

Homesites.—If this unit is used for homesite development, the main limitation is the shallow depth to bedrock. Steepness of slope limits some areas of this unit for building site development. Septic tank absorption fields can be expected to function poorly on this unit.

Excavation for building sites may be limited by the bedrock. It is rippable, however, and therefore is not a serious limitation for most engineering uses. Roads and streets can be built if they are designed to offset the limited ability of the soil in this unit to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

27D—Debenger loam, 12 to 20 percent slopes. This moderately deep, well drained soil is on hills. It formed in colluvium and alluvium derived dominantly from sedimentary rock. The vegetation in areas not cultivated is mainly ponderosa pine, white oak, shrubs, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 46 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark grayish brown loam about 11 inches thick. The subsoil is dark brown loam about 17 inches thick. The underlying material is saprolite derived from metasedimentary rock. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 10 percent Selmac soils in drainage basins and 10 percent Holland soils. Also included are small areas of Ruch soils. The percentage of included soils varies from one area to another.

Permeability of this Debenger soil is moderate. Available water capacity is about 3 to 8 inches. Water supplying capacity is 14 to 19 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture and for homesite development. It is also used for recreation.

Hay and pasture.—This unit is suited to irrigated hay and pasture. The main limitations are steepness of slope and limited rooting depth.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus. Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion.

Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of steepness of slope.

Homesites.—If this unit is used for homesite development, the main limitation is shallow depth to bedrock. Steepness of slope limits use of some areas of this unit for building site development. Septic tank absorption fields can be expected to function poorly on this unit.

Excavation for building sites may be limited by the bedrock. It is rippable, however, and therefore is not a serious limitation for most engineering uses. Roads and streets can be built if they are designed to offset the limited ability of the soil in this unit to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope.

The map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

28F—Dubakella-Pearsoll complex, 35 to 75 percent north slopes. This map unit is on mountains. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 60 percent Dubakella very cobbly clay loam and 30 percent Pearsoll extremely stony clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Eightlar soils on toe slopes and 5 percent Rock outcrop. The percentage of included components varies from one area to another.

The Dubakella soil is moderately deep and well drained. It formed in colluvium derived dominantly from serpentinite. Typically, the surface layer is dark yellowish brown very cobbly clay loam about 2 inches thick. The next layer is dark reddish brown very cobbly clay loam about 5 inches thick. The upper 9 inches of the subsoil is dark reddish brown very cobbly clay loam. The lower 12 inches is dark reddish brown extremely cobbly clay. Serpentine bedrock is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of this Dubakella soil is slow. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Pearsoll soil is shallow and well drained. It formed in colluvium derived dominantly from serpentinite and peridotite. Typically, the surface layer is dark reddish brown extremely stony clay loam about 5 inches thick.

The subsoil is reddish brown extremely cobbly clay about 9 inches thick. Serpentine bedrock is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of this Pearsoll soil is slow. Available water capacity is about 1 inch to 2.5 inches. Water supplying capacity is 9 to 12 inches. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is high.

This unit is used for livestock grazing, watershed, wildlife habitat, and recreation.

Livestock grazing.—The present vegetation in most areas is mainly Jeffrey pine, shrubs, forbs, and grasses. The production of vegetation is limited by the low fertility of the soils and droughtiness. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth.

If this unit is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community. Slope limits access by livestock and promotes overgrazing of the less sloping areas.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Use of mechanical treatment practices is not practical, because the surface is stony and the slopes are steep.

Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of the shallow depth to bedrock and steepness of slope.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and large stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

29F—Dubakella-Pearsoll complex, 35 to 70 percent south slopes. This map unit is on mountainsides. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 69 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 50 percent Dubakella very cobbly clay loam and 40 percent Pearsoll extremely stony clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Rock outcrop. Also included are small areas of Eightlar and Cornutt soils. The percentage of included components varies from one area to another.

The Dubakella soil is moderately deep and well drained. It formed in colluvium derived dominantly from serpentinite. Typically, the surface layer is dark yellowish brown very cobbly clay loam about 2 inches thick. The next layer is dark reddish brown very cobbly clay loam about 5 inches thick. The upper 9 inches of the subsoil is dark reddish brown very cobbly clay loam. The lower 12 inches is dark reddish brown extremely cobbly clay. Serpentine bedrock is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of this Dubakella soil is slow. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Pearsoll soil is shallow and well drained. It formed in colluvium derived dominantly from serpentinite and peridotite. Typically, the surface layer is dark reddish brown extremely stony clay loam about 5 inches thick. The subsoil is reddish brown extremely cobbly clay about 9 inches thick. Serpentine bedrock is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of this Pearsoll soil is slow. Available water capacity is about 1 inch to 2.5 inches. Water supplying capacity is 9 to 12 inches. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is high.

This unit is used for livestock grazing, watershed, wildlife habitat, and recreation.

Livestock grazing.—The present vegetation in most areas is mainly Jeffrey pine, incense-cedar, shrubs, forbs, and grasses. The production of vegetation is limited by the low fertility of the soils and droughtiness. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth.

If this unit is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community. Slope limits access by livestock and promotes overgrazing of the less sloping areas.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Use of mechanical treatment practices is not practical, because the surface is stony and the slopes are steep.

Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer

results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of the shallow depth to bedrock and steepness of slope.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and large stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

30—Dumps. Dumps consists of mine tailings that are mainly on flood plains. The dumps were formed when excavated material was deposited after the valuable minerals had been removed. The vegetation, where present, consists of trees and shrubs. Elevation is 600 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the frost-free season is 140 to 170 days.

Dumps consists mostly of cobbles and pebbles. The finer material has been removed during mining operations. The surface ranges from nearly level to hummocky.

Included in this unit are small areas of sandy loam.

Permeability of Dumps is very rapid. A seasonal high water table occurs in winter and spring.

This unit is a potential source of gravel. Most areas are limited for other uses.

This map unit is in capability subclass VIIIs.

31D—Eightlar extremely stony clay, 5 to 20 percent slopes. This deep, moderately well drained soil is on mountains and alluvial fans. It formed in colluvium and alluvium derived dominantly from serpentinite and peridotite. Elevation is 1,350 to 4,000 feet. The average annual precipitation is about 50 to 70 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface layer is dark reddish brown extremely stony clay about 10 inches thick. The subsoil is dark reddish brown and dark brown extremely stony clay about 34 inches thick. The substratum to a depth of 61 inches or more is dark brown extremely stony clay.

Included in this unit are about 10 percent Dubakella soils, 5 percent Pearsoll soils, and 10 percent soils that are less than 35 percent rock fragments. The percentage of included components varies from one area to another.

Permeability of this Eightlar soil is very slow. Available water capacity is about 3.5 to 7.5 inches. Water supplying capacity is 14 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for livestock grazing, watershed, wildlife habitat, recreation, and homesite development.

Livestock grazing.—The present vegetation in most areas is mainly Jeffrey pine, whiteleaf manzanita and other shrubs, and grasses. The production of vegetation is limited by the low fertility of the soil and droughtiness. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

If this unit is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Use of mechanical treatment practices is not practical, because the surface is stony.

Livestock grazing should be managed to protect the soil from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of steepness of slope.

Homesites.—If this unit is used for homesite development, the main limitations are very slow permeability, large stones, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of the very slow permeability.

The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

The soil in this unit is subject to landsliding and slumping because it is underlain by highly fractured bedrock and is very plastic. Roads for year-round use need heavy base rock. Excavation for roads and buildings increases the hazard of erosion.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens.

Recreation.—If this unit is used for recreational development, the main limitations are large stones, steepness of slope, and very slow permeability. These limitations restrict the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and

the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

31E—Eightlar extremely stony clay, 20 to 35 percent slopes. This deep, moderately well drained soil is on mountains and alluvial fans. It formed in colluvium and alluvium derived dominantly from serpentinite and peridotite. Elevation is 1,350 to 4,000 feet. The average annual precipitation is about 50 to 70 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface layer is dark reddish brown extremely stony clay about 10 inches thick. The subsoil is reddish brown and yellowish red very stony clay about 24 inches thick. The substratum to a depth of 61 inches or more is yellowish red extremely stony clay (fig. 7).

Included in this unit are about 10 percent Dubakella soils, 5 percent Pearsoll soils, and 10 percent soils that are less than 35 percent rock fragments. The percentage of included soils varies from one area to another.

Permeability of this Eightlar soil is very slow. Available water capacity is about 3.5 to 7.5 inches. Water supplying capacity is 14 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used for livestock grazing, watershed, wildlife habitat, recreation, and homesite development.

Livestock grazing.—The present vegetation in most areas is mainly Jeffrey pine, whiteleaf manzanita and other shrubs, and grasses. The production of vegetation is limited by the low fertility of the soil and droughtiness. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

Slope limits access by livestock and promotes overgrazing of the less sloping areas. If this unit is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Use of mechanical treatment practices is not practical, because the surface is stony and the slopes are steep.

Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of steepness of slope.

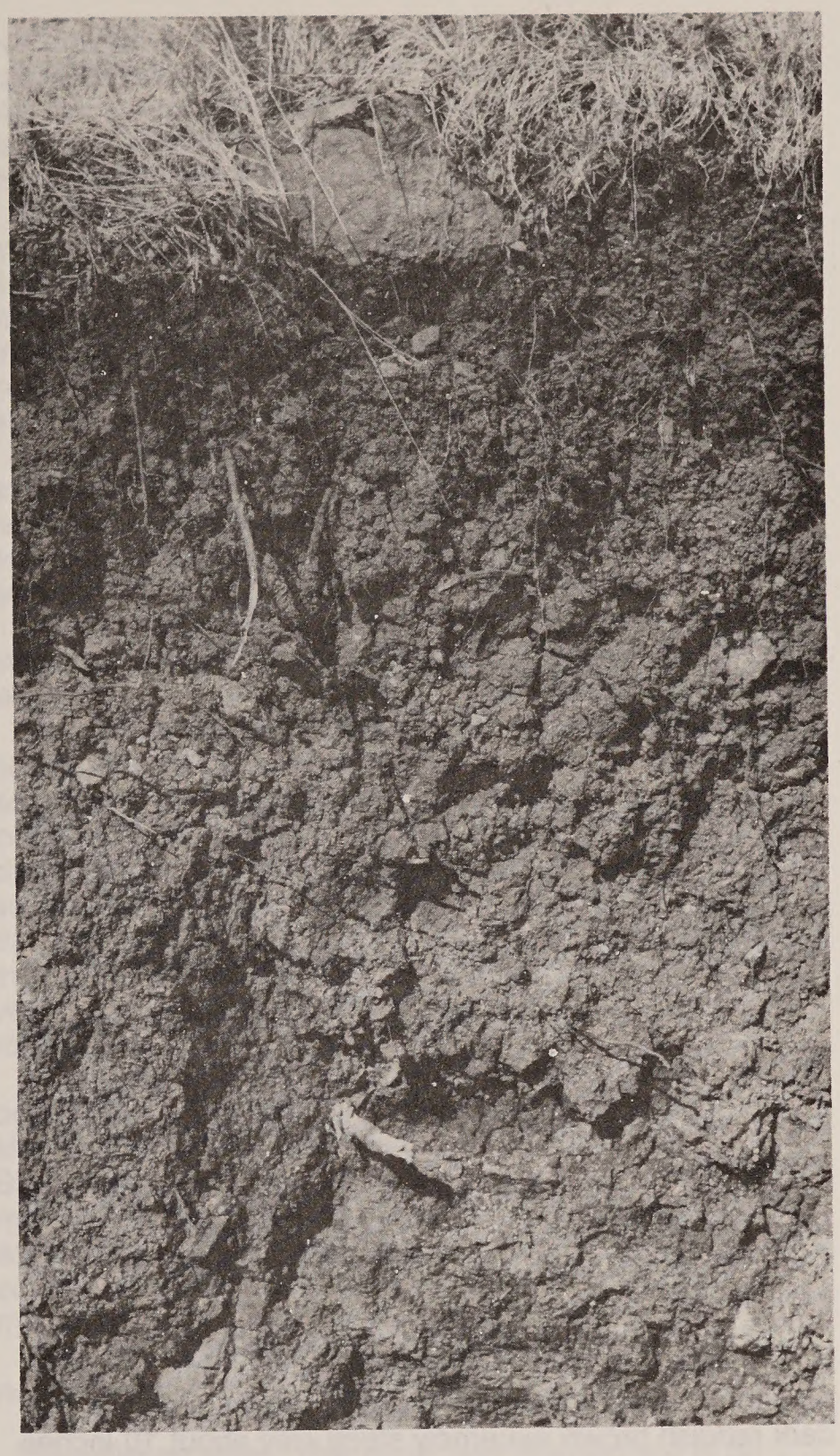


Figure 7.—Typical profile of Eightlar extremely stony clay, 20 to 35 percent slopes.

Homesites.—If this unit is used for homesite development, the main limitations are steepness of slope, very slow permeability, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on the soil in this unit because of steepness of slope and very slow permeability.

The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling. Buildings and roads should be designed to

offset the limited ability of the soil to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

The soil in this unit is subject to landsliding and slumping because it is underlain by highly fractured bedrock and is very plastic. Roads for year-round use need heavy base rock. Excavation for roads and buildings increases the hazard of erosion.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens.

Recreation.—If this unit is used for recreational development, the main limitations are large stones, steepness of slope, and very slow permeability. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

32F—Eightlar-Dubakella complex, 35 to 65 percent north slopes. This map unit is on mountains. Elevation is 1,350 to 4,000 feet. The average annual precipitation is about 40 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 45 percent Eightlar extremely stony clay and 35 percent Dubakella very cobbly clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Cornutt soils, 5 percent Pearsoll soils, and 5 percent Rock outcrop. The percentage of included components varies from one area to another.

The Eightlar soil is deep and moderately well drained. It formed in colluvium derived dominantly from serpentinite and peridotite. Typically, the surface layer is dark reddish brown extremely stony clay about 10 inches thick. The subsoil is dark reddish brown and dark brown extremely stony clay about 34 inches thick. The substratum to a depth of 61 inches or more is dark brown extremely stony clay.

Permeability of the Eightlar soil is very slow. Available water capacity is about 3.5 to 7.5 inches. Water supplying capacity is 14 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Dubakella soil is moderately deep and well drained. It formed in colluvium derived dominantly from serpentinite and peridotite. Typically, the surface layer is dark yellowish brown very cobbly clay loam about 2 inches thick. The next layer is dark reddish brown very cobbly clay loam about 5 inches thick. The upper 9 inches of the subsoil is dark reddish brown very cobbly clay loam. The lower 12 inches is dark reddish brown extremely cobbly clay. Serpentine bedrock is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Dubakella soil is slow. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for livestock grazing, wildlife habitat, watershed, recreation, and timber production.

Livestock grazing.—The present vegetation in most areas is mainly Jeffrey pine, Douglas-fir, incense-cedar, shrubs, and grasses. The production of vegetation is limited by the low fertility of the soil and droughtiness. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth.

Slope limits access by livestock and promotes overgrazing of the less sloping areas. If this unit is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Use of mechanical treatment practices is not practical, because the surface is stony and the slopes are steep.

Livestock grazing should be managed to protect the soils from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of steepness of slope.

Woodland.—Most woodland areas are considered to be impractical to manage because of the low site index and sparse stands of trees; however, timber has been harvested in some areas. The extremely stony clay and very cobbly clay loam surface layer severely limits the use of equipment and makes reforestation difficult. The soils in this unit are subject to landsliding and slumping because they are underlain by highly fractured bedrock and are very plastic. Roads for year-around use need heavy base rock.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope, large stones, and the clayey surface layer. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

33F—Eightlar-Dubakella complex, 35 to 65 percent south slopes. This map unit is on mountains. Elevation is 1,350 to 4,000 feet. The average annual precipitation is about 40 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 45 percent Eightlar extremely stony clay and 40 percent Dubakella very cobbly clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Pearsoll soils, 5 percent Cornutt soils, and 5 percent Rock outcrop. The percentage of included components varies from one area to another.

The Eightlar soil is deep and moderately well drained. It formed in colluvium derived dominantly from serpentinite and peridotite. Typically, the surface layer is dark reddish brown extremely stony clay about 10 inches thick. The subsoil is dark reddish brown and dark brown extremely stony clay about 34 inches thick. The substratum to a depth of 61 inches or more is dark brown extremely stony clay.

Permeability of the Eightlar soil is very slow. Available water capacity is about 3.5 to 7.5 inches. Water supplying capacity is 14 to 18 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Dubakella soil is moderately deep and well drained. It formed in colluvium derived dominantly from serpentinite and peridotite. Typically, the surface layer is dark yellowish brown very cobbly clay loam about 2 inches thick. The next layer is dark reddish brown very cobbly clay loam about 5 inches thick. The upper 9 inches of the subsoil is dark reddish brown very cobbly clay loam. The lower 12 inches is dark reddish brown extremely cobbly clay. Serpentine bedrock is at a depth of 28 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Dubakella soil is slow. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for livestock grazing, wildlife habitat, watershed, recreation, and timber production.

Livestock grazing.—The present vegetation in most areas is mainly Jeffrey pine, Douglas-fir, incense-cedar, shrubs, and grasses. The production of vegetation is limited by the low fertility of the soils and droughtiness. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth.

Slope limits access by livestock and promotes overgrazing of the less sloping areas. If this unit is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Use of mechanical treatment practices is not practical, because the surface is stony and the slopes are steep.

Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of steepness of slope.

Woodland.—Most woodland areas are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas. The extremely stony clay and very cobbly clay loam surface layer severely limits the use of equipment and makes reforestation difficult. The soils in this unit are subject to landsliding and slumping because they are underlain by highly fractured bedrock and are very plastic. Roads for year-round use need heavy base rock.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope, large stones, and the clayey surface layer. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

34—Evans loam. This deep, well drained soil is on flood plains. It formed in recent alluvium. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly conifers, oaks, willows, and grasses. Elevation is 750 to 2,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 150 to 170 days.

Typically, the surface layer is very dark grayish brown loam and silt loam about 23 inches thick. The underlying material to a depth of 60 inches or more is very dark grayish brown silt loam and dark brown very fine sandy loam.

Included in this unit are about 10 percent Newberg soils and 10 percent Camas soils on flood plains, 5 percent Wapato soils in depressional areas and drainageways, and 5 percent Central Point soils on low

stream terraces that are not subject to flooding. Also included are small areas of a soil that is similar to this Evans soil but is gravelly. The percentage of included soils varies from one area to another.

Permeability of this Evans soil is moderate. Available water capacity is about 8.5 to 12 inches. Water supplying capacity is 15 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is slow, but the hazard of water erosion is moderate because of flooding. This soil is subject to occasional, brief periods of flooding in winter and spring. Channeling and deposition are common along streambanks.

This unit is used mainly for irrigated hay and pasture. It is also used as homesites and for recreation and cultivated crops.

Hay and pasture.—This unit is well suited to irrigated hay and pasture crops. It is limited mainly by the hazard of flooding, which can be reduced by the use of levees, dikes, and diversions. Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion.

In summer, irrigation is required for maximum production of crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Pipe, ditch lining, or drop structures should be installed in irrigation ditches to facilitate irrigation and prevent excessive ditch erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Leveling helps to insure the uniform application of water.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed for optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to phosphorus and sulfur.

The organic matter content of the soil can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility and reduces crusting. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Flooding can be controlled by use of major flood control structures, which should be located above the expected flood level.

Recreation.—This unit is suited to recreational development. The hazard of flooding limits the use of this unit mainly to picnic areas, playgrounds, paths, and trails.

This map unit is in capability subclasses IIw, irrigated, and IVw, nonirrigated.

35F—Fantz-Knapke complex, 35 to 85 percent north slopes. This map unit is on mountains. Elevation is 800 to 4,000 feet. The average annual precipitation is about 50 to 70 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 60 percent Fantz very gravelly loam and 30 percent Knapke extremely gravelly loam. The Fantz soil is on mountainsides, and the Knapke soil is on toe slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Dubakella and Pearsoll soils and 5 percent Rock outcrop. The percentage of included components varies from one area to another.

The Fantz soil is moderately deep and well drained. It formed in colluvium derived dominantly from olivine gabbro. Typically, the surface is covered with a mat of partially decomposed twigs, needles, and leaves about 1 inch thick. The surface layer is very dark brown and very dark grayish brown very gravelly loam about 12 inches thick. The underlying material, to a depth of 29 inches, is dark brown extremely cobbly loam. Fractured olivine gabbro is at a depth of 29 inches. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of the Fantz soil is moderate. Available water capacity is about 1.5 to 4.5 inches. Water supplying capacity is 10 to 14 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Knapke soil is deep and well drained. It formed in colluvium derived dominantly from olivine gabbro. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is very dark brown and very dark grayish brown extremely gravelly loam about 8 inches thick. The next layer, to a depth of 13 inches, is dark brown extremely gravelly loam. The underlying material to a depth of 62 inches is dark brown extremely gravelly loam.

Permeability of the Knapke soil is moderate. Available water capacity is about 3 to 7 inches. Water supplying capacity is 13 to 17 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for wildlife habitat, recreation, and timber production.

Woodland.—Most woodland areas are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas. The extremely gravelly loam surface layer severely limits the use of equipment and makes reforestation difficult. The soils in this unit are subject to landsliding and slumping because they are underlain by highly fractured bedrock and are slightly plastic.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and small stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Livestock grazing.—Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of steepness of slope.

This map unit is in capability subclass VIs, nonirrigated.

36F—Fantz-Knapke complex, 35 to 85 percent south slopes. This map unit is on mountainsides and toe slopes. Elevation is 800 to 4,000 feet. The average annual precipitation is about 50 to 80 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 55 percent Fantz very gravelly loam and 30 percent Knapke extremely gravelly loam. The Fantz soil is on mountainsides, and the Knapke soil is on toe slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Dubakella and Pearsoll soils and 5 percent Rock outcrop. The percentage of included components varies from one area to another.

The Fantz soil is moderately deep and well drained. It formed in colluvium derived dominantly from olivine gabbro. Typically, the surface is covered with a mat of partially decomposed twigs, needles, and leaves about 1 inch thick. The surface layer is very dark brown and very dark grayish brown very gravelly loam about 12 inches thick. The underlying material, to a depth of 29 inches, is dark brown extremely cobbly loam. Fractured olivine gabbro bedrock is at a depth of 29 inches. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of the Fantz soil is moderate. Available water capacity is about 1.5 to 4.5 inches. Water supplying capacity is 10 to 14 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Knapke soil is deep and well drained. It formed in colluvium derived dominantly from olivine gabbro. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is very dark brown and very dark grayish brown extremely gravelly loam about 8 inches thick. The next layer, to a depth of 13 inches, is dark brown extremely gravelly loam. The underlying material to a depth of 62 inches or more is dark brown extremely gravelly loam.

Permeability of this Knapke soil is moderate. Available water capacity is about 3 to 7 inches. Water supplying capacity is 13 to 17 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for wildlife habitat, recreation, watershed, and timber production.

Woodland.—Most woodland areas are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas. The extremely gravelly loam surface layer severely limits the use of equipment and makes reforestation difficult. The soils in this unit are subject to landsliding and slumping because they are underlain by highly fractured bedrock and are slightly plastic.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and small stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Livestock grazing.—Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of steepness of slope.

This map unit is in capability subclass VIs, nonirrigated.

37G—Fantz-Rock outcrop complex, 60 to 100 percent south slopes. This map unit is on mountains. Elevation is 800 to 4,000 feet. The average annual precipitation is about 50 to 80 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 60 percent Fantz very gravelly loam and 30 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Dubakella and Pearsoll soils and 5 percent Knapke soils. Also included are areas of soils that have north-facing slopes. The percentage of included soils varies from one area to another.

The Fantz soil is moderately deep and well drained. It formed in colluvium derived dominantly from olivine gabbro. Typically, the surface is covered with a mat of partially decomposed twigs, needles, and leaves about 1 inch thick. The surface layer is very dark brown and very dark grayish brown very gravelly loam about 12 inches thick. The underlying material, to a depth of 29 inches, is dark brown extremely cobbly loam. Fractured olivine gabbro is at a depth of 29 inches. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of the Fantz soil is moderate. Available water capacity is about 1.5 to 4.5 inches. Water supplying capacity is 10 to 14 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

Rock outcrop consists of areas of exposed gabbro bedrock. Runoff from these areas is very rapid.

This unit is used as watershed and for wildlife habitat and recreation.

The present vegetation in most areas is mainly canyon live oak, Douglas-fir, shrubs, and grasses. The production of vegetation is limited by droughtiness.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope, small stones, and areas of Rock outcrop. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIIs, nonirrigated.

38A—Foehlin gravelly loam, 0 to 3 percent slopes. This deep, well drained soil is on alluvial fans and low stream terraces. It formed in alluvium derived dominantly from metamorphic, granitic, and ultramafic rock. The vegetation in areas not cultivated is mainly California black oak, Oregon white oak, Douglas-fir, shrubs, and grasses. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark grayish brown gravelly loam about 13 inches thick. The upper 35 inches of the subsoil is dark brown gravelly clay loam. The lower 12 inches is brown clay loam. The substratum to a depth of 66 inches or more is brown gravelly clay loam.

Included in this unit are about 10 percent Takilma soils on low stream terraces, 10 percent Banning soils on alluvial fans and in drainageways, and 5 percent Kerby soils on low stream terraces. The percentage of included soils varies from one area to another.

Permeability of this Foehlin soil is moderately slow. Available water capacity is about 7.5 to 11 inches. Water supplying capacity is 17 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for irrigated hay and pasture and as homesites. A few areas are used for other cultivated crops, dryland hay and pasture, and recreation.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitation is small stones on the surface.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Leveling also helps to insure the uniform application of water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Forage crops may require supplemental irrigation during the growing season for maximum crop production.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed for optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content of this soil can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are moderately slow permeability, low soil strength, and the potential for shrinking and swelling of the soil. Septic tank absorption fields do not function properly during rainy periods because of moderately slow permeability. This limitation can be overcome by increasing the size of the absorption field.

Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling.

In summer, irrigation is required for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

Recreation.—If this unit is used for recreational development, the main limitation is small stones on the surface.

This map unit is in capability subclasses IIs, irrigated, and IVc, nonirrigated.

38C—Foehlin gravelly loam, 3 to 12 percent slopes. This deep, well drained soil is on alluvial fans and low stream terraces. It formed in alluvium derived dominantly from metamorphic, granitic, and ultramafic rock. The vegetation in areas not cultivated is mainly California black oak, Oregon white oak, Douglas-fir,

Idaho fescue, shrubs, and annual grasses. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark grayish brown gravelly loam about 13 inches thick. The upper 35 inches of the subsoil is dark brown gravelly clay loam. The lower 12 inches is brown clay loam. The substratum to a depth of 66 inches or more is brown gravelly clay loam.

Included in this unit are about 10 percent Takilma soils, 5 percent Ruch soils, and 5 percent Abegg soils. The percentage of included soils varies from one area to another.

Permeability of this Foehlin soil is moderately slow. Available water capacity is about 7.5 to 11 inches. Water supplying capacity is 17 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

Most areas of this unit are used for irrigated hay and pasture, as homesites, and for recreation. A few areas are used for orchards and dryland pasture.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitation is steepness of slope.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion. The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are the potential for shrinking and swelling of the soil and moderately slow permeability. If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling.

Buildings and roads should be designed to offset the limited ability of the soil to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Slope limits use of the steeper areas of this unit for building site development. The hazard of erosion is increased if the soil is left exposed during site development. Preserving as much of the existing plant cover as possible during construction helps to control erosion. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

Septic tank absorption fields may not function properly during rainy periods because of the moderately slow permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for this. Slope is also a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

Recreation.—If this unit is used for recreational development, the main limitation is small stones on the surface.

This map unit is in capability subclasses IIIe, irrigated, and IVe, nonirrigated.

39D—Goodwin very stony sandy loam, 5 to 35 percent slopes. This deep, well drained soil is on mountains. It formed in colluvium derived dominantly from granitic rock. The native vegetation is mainly white fir, Shasta red fir, rhododendron and other shrubs, forbs, and grasses. Elevation is 3,600 to 5,500 feet. The average annual precipitation is about 50 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs about 3 inches thick. The surface layer is very dark brown very stony sandy loam and dark brown very gravelly sandy loam about 16 inches thick. The subsoil is dark brown extremely gravelly sandy loam about 24 inches thick. The substratum is olive brown very gravelly sandy loam about 15 inches thick. It is underlain by highly decomposed grus derived from quartz-diorite. Depth to soft bedrock is 40 to 60 inches.

Included in this unit are about 10 percent Rogue soils, 5 percent Bigelow soils, and 10 percent soils that are more than 60 inches deep. The percentage of included soils varies from one area to another.

Permeability of this Goodwin soil is moderately rapid. Available water capacity is about 3 to 6 inches. Water

supplying capacity is 8 to 13 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for timber production, watershed, wildlife habitat, and recreation.

Woodland.—This unit is suited to the production of white fir and Shasta red fir. Based on a site index of 50 for Shasta red fir, the potential production per acre is 23,950 cubic feet from an even-aged, fully stocked stand of trees 140 years old or 156,000 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 130 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness and frost heaving. Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Shasta red fir and white fir.

Recreation.—If this unit is used for recreational development, the main limitations are stones and steepness of slope. Coarse fragments in the surface layer limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

40F—Goodwin very stony sandy loam, 35 to 65 percent north slopes. This deep, well drained soil is on mountains. It formed in colluvium derived dominantly from granitic rock. The native vegetation is mainly white fir, Shasta red fir, rhododendron and other shrubs, forbs, and grasses. Elevation is 3,600 to 5,500 feet. The average annual precipitation is about 50 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs about 3 inches thick. The surface layer is very dark brown very stony sandy loam and dark brown very gravelly sandy loam about 16 inches thick. The subsoil is dark brown extremely gravelly sandy loam about 24 inches thick. The substratum is olive brown very gravelly sandy loam about 15 inches thick. It is underlain by highly decomposed grus derived from quartz-diorite. Depth to soft bedrock is 40 to 60 inches.

Included in this unit are about 10 percent Rogue soils and 15 percent soils that are more than 60 inches deep. Also included are small areas of Bigelow and Crannler soils. The percentage of included soils varies from one area to another.

Permeability of this Goodwin soil is moderately rapid. Available water capacity is about 3 to 6 inches. Water supplying capacity is 8 to 13 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, wildlife habitat, and recreation.

Woodland.—This unit is well suited to the production of white fir and Shasta red fir. Based on a site index of 50 for Shasta red fir, the potential production per acre is 23,950 cubic feet from an even-aged, fully stocked stand of trees 140 years old or 156,000 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 130 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation, steepness of slope, and the hazard of erosion. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits

the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness and frost heaving. Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil reduces seedling survival. Mulching around seedlings helps to retain moisture in summer. Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Shasta red fir and white fir.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit the unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

41F—Goodwin very stony sandy loam, 35 to 65 percent south slopes. This deep, well drained soil is on mountains. It formed in colluvium derived dominantly from granitic rock. The native vegetation is mainly white fir, Shasta red fir, rhododendron and other shrubs, forbs, and grasses. Elevation is 4,000 to 5,500 feet. The average annual precipitation is about 50 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs about 2 1/2 inches thick. The surface layer is very dark brown very stony sandy loam about 16 inches thick. The subsoil is dark yellowish brown and brown very gravelly sandy loam about 24 inches thick. The substratum is olive brown very gravelly sandy loam about 15 inches thick. Highly decomposed grus derived from granitic rock is at a depth of 55 inches. Depth to soft bedrock is 40 to 60 inches.

Included in this unit are about 10 percent Rogue soils and 10 percent soils that are 60 inches deep or more. Also included are small areas of Bigelow and Crannler soils. The percentage of included soils varies from one area to another.

Permeability of this Goodwin soil is moderately rapid. Available water capacity is about 3 to 6 inches. Water supplying capacity is 8 to 13 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, the hazard of water erosion is high.

This unit is used for timber production, watershed, wildlife habitat, and recreation.

Woodland.—This unit is well suited to the production of white fir and Shasta red fir. Based on a site index of 40 for Shasta red fir, the potential production per acre is 18,950 cubic feet or 136,000 board feet (International rule, one-eighth inch kerf). Production is estimated for an even-aged, fully stocked stand of trees 140 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation, steepness of slope, and the hazard of erosion. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness and frost heaving. Drought can occur either in summer or in winter. Droughtiness caused by coarse

fragments in the soil reduces seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can also be improved by providing shade for seedlings.

Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Shasta red fir and white fir.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

42B—Holland sandy loam, cool, 2 to 7 percent slopes. This deep, well drained soil is on foot slopes of hills and on ridges. It formed in colluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, sugar pine, madrone, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface is covered with a mat of partially decomposed needles and leaves about 1/2 inch thick. The surface layer is brown sandy loam about 6 inches thick. The next layer is brown sandy loam about 8 inches thick. The subsoil is reddish brown sandy clay loam about 35 inches thick over decomposed granite. Depth to soft bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Barron soils on toe slopes and fans, 5 percent Siskiyou soils on foot slopes and ridges, and 5 percent Clawson, Manita, and Pollard soils. Also included are small areas of soils that are more than 60 inches deep. The percentage of included soils varies from one area to another.

Permeability of this Holland soil is moderately slow. Available water capacity is about 6 to 11 inches. Water supplying capacity is 12 to 17 inches. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for timber production.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed for optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to phosphorus and sulfur.

Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are moderately slow permeability and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of the moderately slow permeability. Use of sandy backfill for the trench and long absorption lines helps to overcome this limitation.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structural damage as a result of shrinking and swelling.

Plans for homesite development on this unit should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas that have had the surface layer removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 110 for ponderosa pine, the potential production per acre is 4,880 cubic feet from an even-aged, fully stocked stand of trees 40 years old or 50,080 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 80 years old.

The main concern in producing and harvesting timber is the difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Minimizing the risk of erosion is essential in forest management. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

This map unit is in capability subclasses IIe, irrigated, and IVe, nonirrigated.

42C—Holland sandy loam, cool, 7 to 12 percent slopes. This deep, well drained soil is on foot slopes of hills and on ridges. It formed in colluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, sugar pine, madrone, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface is covered with a mat of partially decomposed needles and leaves about 1/2 inch thick. The surface layer is dark grayish brown and brown sandy loam about 8 inches thick. The upper 20 inches of the subsoil is brown sandy loam and yellowish red sandy clay loam. The lower 21 inches is yellowish red and strong brown sandy loam. Weathered granite is at a depth of 49 inches. Depth to soft bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Siskiyou soils and 10 percent Pollard and Josephine soils. Also included are small areas of soils that are more than 60 inches deep. The percentage of included soils varies from one area to another.

Permeability of this Holland soil is moderately slow. Available water capacity is about 12 to 17 inches. Water supplying capacity is 10 to 20 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for timber production.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitation is steepness of slope.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are moderately slow permeability and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of the moderately slow permeability. Use of sandy backfill for the trench and long absorption lines helps to overcome this limitation. Slope is also a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Access roads should be designed to provide adequate cut-slope grade, and drains are needed to control surface runoff and keep soil losses to a minimum.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 110 for ponderosa pine, the potential production per

acre is 4,880 cubic feet from an even-aged, fully stocked stand of trees 40 years old or 50,080 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 80 years old.

The main concerns in producing and harvesting timber are the hazard of erosion and the difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve growth of plants on the soil in this unit.

Minimizing the risk of erosion is essential in forest management. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

42D—Holland sandy loam, cool, 12 to 20 percent slopes. This deep, well drained soil is on hills. It formed in colluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, madrone, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface is covered with a mat of partially decomposed needles and leaves about 1/2 inch thick. The surface layer is dark grayish brown and brown sandy loam about 8 inches thick. The upper 20 inches of the subsoil is brown sandy loam and yellowish red sandy clay loam. The lower 21 inches is yellowish red and strong brown sandy loam. Weathered granite is at a depth of 49 inches. Depth to soft bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Siskiyou soils and 10 percent Pollard and Josephine soils. Also included are small areas of soils that are more than 60 inches deep. The percentage of included soils varies from one area to another.

Permeability of this Holland soil is moderately slow. Available water capacity is about 6 to 11 inches. Water supplying capacity is 12 to 17 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used mainly for timber production and for hay and pasture. It is also used as homesites.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 100 for ponderosa pine, the potential production per acre is 4,080 cubic feet from an even-aged, fully stocked stand of trees 40 years old or 45,630 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Minimizing the risk of erosion is essential in forest management. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts root growth. When the soil is dry, skid trails and landings can be ripped to improve growth of plants.

Hay and pasture.—This unit is suited to irrigated hay and pasture. The main limitation is steepness of slope.

In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using

management that maintains optimum vigor and quality of forage plants is a good practice. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth. Fertilizer is needed for optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition.

Homesites.—If this unit is used for homesite development, the main limitations are steepness of slope, moderately slow permeability, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of the moderately slow permeability. Use of sandy backfill for the trenches and long absorption lines helps to overcome this limitation. Steepness of slope is also a concern in installing septic tank absorption fields. Installing absorption lines on the contour helps to overcome this limitation.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from the buildings help to prevent structural damage as a result of shrinking and swelling. Access roads must be designed to provide adequate cut-slope grade, and drains must be used to control surface runoff and keep soil losses to a minimum.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas that have had the surface layer removed. Topsoil can be stockpiled and used to reclaim areas disturbed by cutting and filling. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

42E—Holland sandy loam, cool, 20 to 35 percent slopes. This deep, well drained soil is on hills. It formed in colluvium derived dominantly from granitic rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, madrone, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface is covered with a mat of partially decomposed needles and leaves about 1/2 inch thick. The surface layer is dark grayish brown and brown sandy loam about 8 inches thick. The upper 20 inches of the subsoil is brown sandy loam and yellowish red sandy clay loam. The lower 21 inches is yellowish red and strong brown sandy loam. Weathered granite is at a depth of 49 inches. Depth to soft bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Siskiyou soils and 10 percent Pollard and Josephine soils. Also included are small areas of soils that are more than 60 inches deep. The percentage of included soils varies from one area to another.

Permeability of this Holland soil is moderately slow. Available water capacity is about 6 to 12 inches. Water supplying capacity is 12 to 17 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used mainly for timber production and as homesites. It is also used for pasture.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 100 for ponderosa pine, the potential production per acre is 4,080 cubic feet from an even-aged, fully stocked stand of trees 40 years old or 45,630 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve growth of plants.

Minimizing the risk of erosion is essential in forest management. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Homesites.—If this unit is used for homesite development, the main limitation is steepness of slope. Excavation for roads and buildings increases the hazard of erosion. Structures to divert runoff are needed if roads and buildings are constructed. Septic tank absorption fields can be expected to function poorly on this unit because of slope and moderately slow permeability.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Pasture.—If this unit is used for pasture, the main limitation is steepness of slope. All tillage should be on the contour or across the slope. Terraces reduce runoff and the risk of erosion and help to conserve moisture.

This map unit is in capability subclass VIe, nonirrigated.

43E—Jayar very gravelly loam, 20 to 35 percent slopes. This moderately deep, well drained soil is on mountainsides and rounded ridgetops. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly white fir, Douglas-fir, Shasta red fir, rhododendron and other shrubs, forbs, sedges, and grasses. Elevation is 3,600 to 5,500 feet. The average annual precipitation is about 40 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of leaves and needles about 3 inches thick. The surface layer is dark brown very gravelly loam about 3 inches thick. The next layer is dark yellowish brown very gravelly loam about 9 inches thick. The upper 7 inches of the subsoil is brown very gravelly loam. The lower 12 inches is dark yellowish brown very gravelly loam. Metavolcanic bedrock is at a depth of 31 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 15 percent Althouse soils and 5 percent Woodseye soils. Also included are small areas of Perdin soils. The percentage of included soils varies from one area to another.

Permeability of this Jayar soil is moderate. Available water capacity is about 1.5 to 5 inches. Water supplying capacity is 9 to 12 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for timber production, watershed, wildlife habitat, and recreation.

Woodland.—This unit is well suited to the production of Douglas-fir, Shasta red fir, and white fir. Based on a site index of 118 for Douglas-fir, the potential production per acre is 6,660 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 61,290 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are difficulty of reforestation and the hazard of erosion. Minimizing the risk of erosion is essential in forest management. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. Compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of droughtiness and frost heaving. Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, Shasta red fir, and white fir.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and small stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

44F—Jayar very gravelly loam, 35 to 70 percent north slopes. This moderately deep, well drained soil is on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly white fir, Douglas-fir, Shasta red fir, rhododendron and other shrubs, forbs, grasses, and sedges. Elevation is 3,600 to 5,500 feet. The average annual precipitation is about 40 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of needles, leaves, bark, and lichens about 1 inch thick. The surface layer is dark yellowish brown very gravelly loam about 3 inches thick. The upper 11 inches of the subsoil is dark brown very gravelly loam. The lower 17 inches is dark brown extremely gravelly loam. Metavolcanic bedrock is at a depth of 31 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 10 percent Althouse soils and 5 percent Woodseye soils. Also included are small areas of Perdin soils and Rock outcrop. The percentage of included components varies from one area to another.

Permeability of this Jayar soil is moderate. Available water capacity is about 1.5 to 5 inches. Water supplying capacity is 9 to 12 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, wildlife habitat, and recreation.

Woodland.—This unit is well suited to the production of Douglas-fir, white fir, and Shasta red fir. Based on a site index of 118 for Douglas-fir, the potential production per acre is 6,660 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 61,290 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness and frost heaving. Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among trees that are suitable for planting are Douglas-fir, Shasta red fir, and white fir.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and small stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit the unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is capability subclass VIIs, nonirrigated.

45F—Jayar very gravelly loam, 35 to 70 percent south slopes. This moderately deep, well drained soil is on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly white fir, Douglas-fir, Shasta red fir, rhododendron and other shrubs, forbs, grasses, and sedges. Elevation is 4,000 to 5,500 feet. The average annual precipitation is about 40 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs about 2 inches thick. The surface layer is dark brown very gravelly loam about 3 inches thick.

The upper 9 inches of the subsoil is dark yellowish brown very gravelly loam. The lower 19 inches is dark brown very gravelly clay loam. Metavolcanic bedrock is at a depth of 31 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 15 percent Woodseye soils and 10 percent Althouse soils. Also included are small areas of Perdin soils and Rock outcrop. The percentage of included components varies from one area to another.

Permeability of this Jayar soil is moderate. Available water capacity is about 1.5 to 5 inches. Water supplying capacity is 9 to 12 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, wildlife habitat, and recreation.

Woodland.—This unit is suited to the production of Douglas-fir, white fir, and Shasta red fir. Based on a site index of 95 for Douglas-fir, the potential production per acre is 4,620 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 46,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and the difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness and frost heaving. Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade for seedlings.

Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, white fir, and Shasta red fir.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and small stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

46—Jerome sandy loam. This deep, somewhat poorly drained soil is in drainageways and on alluvial fans. It formed in alluvium derived dominantly from granitic and metamorphic rock. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly sedges, grasses, and willows. Elevation is 800 to 1,800 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is 52 to 55 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark grayish brown and brown sandy loam about 10 inches thick. The subsoil is gray sandy loam about 7 inches thick. The substratum is light brownish gray sandy loam about 18 inches thick. The next layer to a depth of 64 inches or more is a buried subsoil of dark grayish brown and brown silty clay and clay.

Included in this unit are about 10 percent Clawson soils and 5 percent Barron soils. Also included are small areas of Cove and Wapato soils. The percentage of included soils varies from one area to another.

Permeability of this Jerome soil is moderately rapid to a depth of 35 inches and very slow below this depth. Available water capacity is 3.5 to 5.5 inches. Water

supplying capacity is 15 to 17 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 6 to 18 inches in winter and spring. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for irrigated hay and pasture and as homesites. A few areas are used for recreation, wildlife habitat, and dryland pasture.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by wetness, very slow permeability in the buried subsoil, and poor outlets. Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Irrigation water needs to be applied carefully to prevent the development of a high water table, and drainage may also be needed. Leveling helps to insure the uniform application of water.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are wetness, the very slow permeability in the buried subsoil, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of the high water table and very slow permeability.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Drainage should be provided for buildings with basements and crawl spaces because of the seasonal high water table. Wetness can be reduced by installing drain tile around footings.

Recreation.—If this unit is used for recreational development, the main limitations are wetness and the very slow permeability of the buried subsoil. Drainage should be provided.

This map unit is in capability subclass IIIw, irrigated and nonirrigated.

47E—Josephine gravelly loam, 20 to 35 percent slopes. This deep, well drained soil is on mountainsides and ridges (fig. 8). It formed in colluvium and residuum derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, Pacific madrone, California black oak, shrubs, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of partially decomposed needles and leaves about 1 inch thick. The surface layer is dark reddish brown gravelly loam about 9 inches thick. The upper 16 inches of the subsoil is dark reddish brown and reddish brown clay loam. The lower 34 inches is red clay loam. Highly weathered metamorphic bedrock is at a depth of 59 inches. Depth to bedrock ranges from 40 to 60 inches (fig. 9).

Included in this unit are about 15 percent Speaker soils, 10 percent Pollard soils, and 5 percent soils that are similar to this Josephine soil but are more than 35 percent rock fragments. Also included are small areas of Cornutt and Dubakella soils. The percentage of included soils varies from one area to another.

Permeability of this Josephine soil is moderately slow. Available water capacity is about 4.5 to 12 inches. Water supplying capacity is 15 to 20 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for timber production. It is also used as watershed and for wildlife habitat, recreation, and some livestock grazing.

Woodland.—This unit is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 120 for Douglas-fir, the potential production per acre is 6,900 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 63,900 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. Compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the



Figure 8.—Area of Josephine gravelly loam, 20 to 35 percent slopes.



Figure 9.—Typical profile of Josephine gravelly loam, 20 to 35 percent slopes.

soil is least susceptible to compaction. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIe, nonirrigated.

48F—Josephine gravelly loam, 35 to 55 percent north slopes. This deep, well drained soil is on mountainsides. It formed in colluvium and residuum derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, Pacific madrone, California black oak, shrubs, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of partially decomposed needles and leaves about 2 inches thick. The surface layer is dark brown gravelly loam about 3 inches thick. The upper 6 inches of the subsoil is brown gravelly loam. The lower 50 inches is reddish brown and yellowish red clay loam and gravelly clay loam. Saprolitic siltstone is at a depth of 59 inches. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 25 percent Speaker soils, 10 percent Pollard soils, and 10 percent soils that are similar to this Josephine soil but are more than 35 percent rock fragments. Also included are small areas of Cornutt, Dubakella, Beekman, and Colestine soils. The percentage of included soils varies from one area to another.

Permeability of this Josephine soil is moderately slow. Available water capacity is about 4.5 to 12 inches. Water supplying capacity is 15 to 20 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production. It is also used as watershed, for wildlife habitat, and for some livestock grazing.

This unit is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 130 for Douglas-fir, the potential production per acre is 7,740 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 75,690 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

This unit is subject to slumping, especially where road cuts are made in the steeper areas. Slumping can be minimized by locating roads in the more gently sloping areas and by using properly designed road drainage systems.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other logging systems that partially or fully suspend the logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIe, nonirrigated.

49D—Jumpoff clay loam, 7 to 20 percent slopes. This deep, moderately well drained soil is on hills. It formed in colluvium derived dominantly from volcanic tuff and breccia. The native vegetation is mainly Douglas-fir, ponderosa pine, incense-cedar, Pacific madrone, California black oak, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 45 inches, the average annual air temperature is 46 to 52 degrees F, and average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of needles and twigs about 1 inch thick. The surface layer is dark grayish brown clay loam about 12 inches thick. The subsoil is brown and dark brown clay about 43 inches thick. Weathered saprolite is at a depth of 55 inches. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Selmac soils in concave areas, 10 percent soils that are similar to this Jumpoff soil but have a cobbly clay loam surface layer, and 5 percent Abegg soils. Also included are small areas of Cornutt and Dubakella soils. The percentage of included soils varies from one area to another.

Permeability of this Jumpoff soil is slow. Available water capacity is about 5 to 10.5 inches. Water supplying capacity is 16 to 21 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. A water table is at a depth of 30 to 42 inches in winter and spring.

This unit is used mainly for timber production and irrigated hay and pasture. It is also used for dryland pasture, watershed, recreation, and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 90 for Douglas-fir, the potential production per acre is 4,200 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 41,030 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Roads for year-round use need heavy base rock.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. Compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of plant competition for available soil moisture, plant nutrients, and sunlight. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Hay and pasture.—This unit is suited to hay and pasture. The main limitations are steepness of slope, slow permeability, and wetness. Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is also needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways also help to control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This map unit is in capability subclasses IIIe, irrigated, and IVe, nonirrigated.

49E—Jumpoff clay loam, 20 to 35 percent slopes. This deep, moderately well drained soil is on hills. It formed in colluvium derived dominantly from volcanic tuff and breccia. The native vegetation is mainly Douglas-fir, ponderosa pine, incense-cedar, Pacific madrone, California black oak, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 45 inches, the average annual air temperature is 46 to 52 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of needles and twigs about 3 inches thick. The surface layer is dark grayish brown clay loam about 18 inches thick. The subsoil is yellowish brown clay about 33 inches thick. The substratum to a depth of 55 inches is yellowish brown and light yellowish brown clay. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Selmac soils in concave areas, 10 percent Josephine soils, and 10 percent soils that are similar to this Jumpoff soil but have a cobbly clay loam surface layer. Also included are small areas of Cornutt and Dubakella soils. The percentage of included soils varies from one area to another.

Permeability of the Jumpoff soil is slow. Available water capacity is about 5 to 10.5 inches. Water supplying capacity is 16 to 21 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. A water table is at a depth of 30 to 42 inches in winter and spring.

This unit is used mainly for timber production and dryland pasture. It is also used as watershed and for recreation and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 90 for Douglas-fir, the potential production per acre is 4,200 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 41,030 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, the susceptibility of the soil to slumping, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management.

This unit is subject to slumping, especially where road cuts are made in the steeper areas. Slumping can be minimized by locating roads in the more gently sloping areas and by using properly designed road drainage systems. Because of seasonal wetness, roads for year-round use need heavy base rock.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. Compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants on the soil.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of plant competition for available soil moisture, plant nutrients, and sunlight. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Trees are subject to windthrow.

Pasture.—If this unit is used for dryland pasture, the main limitations are steepness of slope, the hazard of

erosion, slow permeability, and the lack of adequate moisture during the growing season. All tillage should be on the contour or across the slope. Terraces reduce runoff and the risk of erosion and help to conserve moisture.

This map unit is in capability subclass VIe, nonirrigated.

50F—Jumpoff clay loam, 35 to 50 percent north slopes. This deep, moderately well drained soil is on hills. It formed in colluvium derived dominantly from volcanic tuff and breccia. The native vegetation is mainly Douglas-fir, ponderosa pine, incense-cedar, Pacific madrone, California black oak, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 45 inches, the average annual air temperature is 46 to 52 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface layer is dark grayish brown and brown clay loam about 18 inches thick. The subsoil is yellowish brown clay about 19 inches thick. The substratum is yellowish brown and grayish brown clay about 18 inches thick and is underlain by saprolite. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Selmac soils in concave areas, 10 percent Josephine soils, and 10 percent soils that are similar to this Jumpoff soil but have a cobbly clay loam surface layer. Also included are small areas of Cornutt, Dubakella, and Beekman soils. The percentage of included soils varies from one area to another.

Permeability of the Jumpoff soil is slow. Available water capacity is about 5 to 10.5 inches. Water supplying capacity is 16 to 21 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. A water table is at a depth of 30 to 42 inches in winter and spring.

This unit is used mainly for timber production. It is also used for wildlife habitat, recreation, and watershed.

Woodland.—This unit is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 120 for Douglas-fir, the potential production per acre is 6,900 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 63,900 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, susceptibility of the soil to slumping and landslides, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management.

This unit is subject to slumping, especially where road cuts are made in the steeper areas. Slumping can be minimized by locating roads in the more gently sloping areas and by using properly designed road drainage systems. Because of seasonal wetness, roads for year-round use need heavy base rock.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants on the soil.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of plant competition for available soil moisture, plant nutrients, and sunlight. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Trees are subject to windthrow because of limited rooting depth.

This map unit is in capability subclass VIe, nonirrigated.

51F—Jumpoff clay loam, 35 to 50 percent south slopes. This deep, moderately well drained soil is on hills. It formed in colluvium derived dominantly from volcanic tuff and breccia. The native vegetation is mainly Douglas-fir, ponderosa pine, incense-cedar, Pacific madrone, California black oak, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 45 inches, the average annual air temperature is 46 to 52 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface layer is covered with a mat of needles and twigs about 1 inch thick. The surface layer is dark grayish brown clay loam about 12 inches thick. The next layer is dark grayish brown clay loam about 6 inches thick. The subsoil is light olive brown and brown clay about 37 inches thick. Saprolite is at a depth of 55 inches. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Josephine and Speaker soils, 10 percent soils that are similar to this Jumpoff soil but have a cobbly clay loam surface layer, and 5 percent Selmac soils. Also included are small areas of Cornutt, Dubakella, Beekman, and Colestine soils. The percentage of included soils varies from one area to another.

Permeability of this Jumpoff soil is slow. Available water capacity is about 5 to 10.5 inches. Water supplying capacity is 16 to 21 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high. A water table is at a depth of 30 to 42 inches in winter and spring.

This unit is used mainly for timber production. It is also used as watershed and for recreation and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 90 for Douglas-fir, the potential production per acre is 4,200 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 41,030 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, susceptibility to landslides and slumping, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management.

This unit is subject to slumping, especially where road cuts are made in the steeper areas. Slumping can be minimized by locating roads in the more gently sloping areas and by using properly designed road drainage systems. Because of seasonal wetness, roads for year-round use need heavy base rock.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants on the soil.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of plant competition for available soil moisture and soil nutrients. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade for seedlings.

Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Trees are subject to windthrow because of limited rooting depth.

This map unit is in capability subclass VIe, nonirrigated.

52—Kerby loam. This deep, well drained soil is on low stream terraces. It formed in alluvium of mixed origin. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, California black oak, and grasses. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark brown loam about 7 inches thick. The subsoil is brown loam about 33 inches thick. The substratum to a depth of 60 inches or more is brown and very dark grayish brown extremely gravelly sandy loam and extremely gravelly sand.

Included in this unit are about 10 percent Takilma soils and 5 percent Evans soils on flood plains. Also included are small areas of Central Point and Foehlin soils. Many areas include stringers of a soil that is similar to this Kerby soil but is more than 35 percent rock fragments in the upper 40 inches. These areas are several feet wide and 100 to 200 feet long in places. They do not occur in a predictable pattern, but they make up about 10 percent of the soils in the unit. The percentage of included soils varies from one area to another.

Permeability of this Kerby soil is moderate to a depth of 40 inches and rapid below this depth. Available water capacity is about 7.5 to 10 inches. Water supplying capacity is 18 to 21 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture and as homesites. It is also used for recreation, dryland pasture, and adapted cultivated crops.

Hay and pasture.—This unit has few limitations for hay and pasture (fig. 10). In summer, irrigation is needed for maximum production of most crops. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Use of pipe, ditch lining, or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Leveling helps to insure the uniform application of water.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to

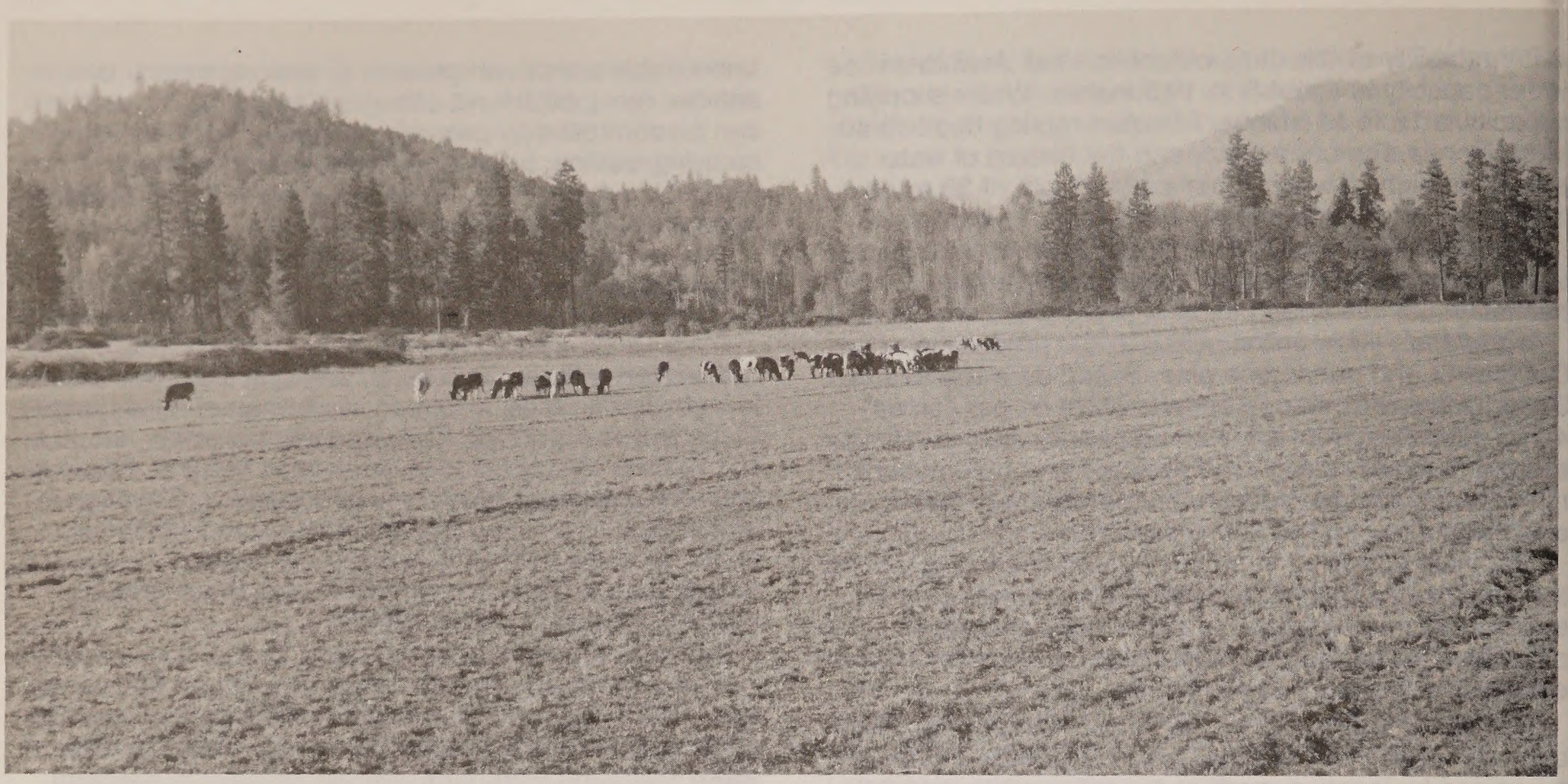


Figure 10.—Well managed irrigated hay and pasture on Kerby loam.

insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer and poor tilth. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—This unit is suited to homesite development. The main limitations are seepage and the susceptibility of cutbanks to caving in. Septic tank absorption fields may not function properly because the gravelly sand substratum is a poor filter. Ground water may be contaminated by sewage that is not properly filtered and treated.

Recreation.—This unit is limited for recreation by the tendency of the surface layer to become dusty when dry.

This map unit is in capability class I, irrigated, and subclass IVc, nonirrigated.

53B—Manita loam, 2 to 7 percent slopes. This deep, well drained soil is on fans and hills. It formed in colluvium and alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, black oak, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 47 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of decomposed forest litter about 1/2 inch thick. The surface layer is dark reddish brown loam about 11 inches thick. The upper 9 inches of the subsoil is reddish brown clay loam. The lower 30 inches is reddish brown clay. Depth to weathered bedrock ranges from 40 to 60 inches. In some areas depth to bedrock is more than 60 inches.

Included in this unit are about 10 percent Abegg soils and 5 percent Ruch soils. Also included are small areas of Pollard soils. Seeps or springs are in some areas of soils that generally have a dense clay layer below a depth of 40 inches. The percentage of included soils varies from one area to another.

Permeability of this Manita soil is moderately slow. Available water capacity is about 5 to 12 inches. Water

supplying capacity is 16 to 22 inches. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture, homesites, and timber production. It is also used for wildlife habitat and corn silage and other cultivated crops.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. It has few limitations.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Leveling also helps to insure the uniform application of water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are the moderately slow permeability and the potential for shrinking and swelling of the soil. Septic tank absorption fields may not function properly during rainy periods because of moderately slow permeability. Use of sandy backfill for the trenches and long absorption lines helps to compensate for the moderately slow permeability.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Recreation.—This unit is well suited to recreational development. It has few limitations; however, the surface layer tends to become dusty when dry.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 94 for Douglas-fir, the potential production per acre is 4,500 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 45,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concern in producing and harvesting timber is the difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Minimizing the risk of erosion is essential in forest management.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine. Tree seedlings have only a moderate rate of survival because of the lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclasses IIe, irrigated, and IVe, nonirrigated.

53C—Manita loam, 7 to 12 percent slopes. This deep, well drained soil is on fans and hills. It formed in colluvium and alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, Pacific madrone, black oak, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 47 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of decomposed forest litter about 1/2 inch thick. The surface layer is dark reddish brown loam about 11 inches thick. The upper 9 inches of the subsoil is reddish brown clay loam. The lower 30 inches is reddish brown clay. Depth to weathered bedrock ranges from 40 to 60 inches or more.

Included in this unit is about 5 percent Abegg soils and 5 percent Ruch soils. Also included are small areas of

Pollard soils. Seeps or springs are in some areas that generally have a dense clay layer below a depth of 40 inches. The percentage of included soils varies from one area to another.

Permeability of this Manita soil is moderately slow. Available water capacity is about 5 to 12 inches. Water supplying capacity is 16 to 22 inches. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture, homesites, and timber production. It is also used for recreation, wildlife habitat, and corn silage and other cultivated crops.

Hay and pasture.—This unit is well suited to hay and pasture. The main limitation is steepness of slope.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall, stubble-mulch tillage, and grassed waterways help to control erosion. The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are moderately slow permeability and the potential for shrinking and swelling of the soil. The hazard of erosion is increased if the soil is left exposed during site development. Preserving as much of the existing plant cover as possible during construction helps to control erosion.

Septic tank absorption fields may not function properly during rainy periods because of moderately slow permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for this. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and dustiness when the soil is dry.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 94 for Douglas-fir, the potential production per acre is 4,500 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 45,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are the hazard of erosion and the difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Minimizing the risk of erosion is essential in forest management.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine. Tree seedlings have only a moderate rate of survival because of the lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

53D—Manita loam, 12 to 20 percent slopes. This deep, well drained soil is on fans and hills. It formed in colluvium and alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, Pacific madrone, black oak, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 47 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of decomposed forest litter about 1/2 inch thick. The surface layer is dark reddish brown loam about 11 inches thick. The upper 9 inches of the subsoil is reddish brown clay loam. The lower 30 inches is reddish brown clay. Depth to weathered bedrock ranges from 40 to 60 inches or more.

Included in this unit is about 5 percent Ruch soils. Also included are small areas of Abegg, Pollard, and Foehlin soils. The percentage of included soils varies from one area to another.

Permeability of this Manita soil is moderately slow. Available water capacity is about 5 to 12 inches. Water supplying capacity is 16 to 22 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production, irrigated hay and pasture, and homesites. It is also used for wildlife habitat, recreation, and watershed.

Woodland.—This unit is suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 94 for Douglas-fir, the potential production per acre is 4,500 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 45,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, difficulty of reforestation, and steepness of slope. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine. Tree seedlings have only a moderate rate of survival because of the lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Hay and pasture.—This unit is suited to irrigated hay and pasture. The main limitation is steepness of slope.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are steepness of slope, moderately slow permeability, and the potential for shrinking and swelling of the soil. Steepness of slope limits use of the steeper areas of this unit for building site development. The hazard of erosion is increased if the soil is left exposed during site development. Preserving as much of the existing plant cover as possible during construction helps to control erosion.

Septic tank absorption fields may not function properly during rainy periods because of the moderately slow permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for this limitation. Slope is also a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and dustiness when the soil is dry.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

53E—Manita loam, 20 to 35 percent slopes. This deep, well drained soil is on hills and mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, black oak, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 47 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of decomposed leaves, needles, and twigs about 1/2 inch thick. The surface layer is dark reddish brown loam about 11 inches thick. The upper 9 inches of the subsoil is reddish brown clay loam. The lower 30 inches is reddish brown clay. Depth to weathered bedrock ranges from 40 to 60 inches or more.

Included in this unit is about 10 percent Vannoy soils. Also included are small areas of Pollard soils. The percentage of included soils varies from one area to another.

Permeability of this Manita soil is moderately slow. Available water capacity is 5 to 12 inches. Water supplying capacity is 16 to 22 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and as homesites. It is also used for irrigated and dryland hay and pasture, wildlife habitat, and recreation.

Woodland.—This unit is suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 94 for Douglas-fir, the potential production per acre is 4,500 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 45,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, the difficulty of reforestation, and steepness of slope. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine. Tree seedlings have only a moderate rate of survival because of the lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Homesites.—If this unit is used for homesite development, the main limitations are steepness of slope, moderately slow permeability, and the potential for shrinking and swelling of the soil. Excavation for roads and buildings increases the hazard of erosion. Structures to divert runoff are needed if buildings and roads are constructed.

Septic tank absorption fields can be expected to function poorly on this unit because of moderately slow permeability and steepness of slope.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Hay and pasture.—If this unit is used for hay and pasture, the main limitation is steepness of slope. All tillage should be on the contour or across the slope. Terraces reduce runoff and the risk of erosion and help to conserve moisture.

This map unit is in capability subclass VIe, nonirrigated.

54F—Manita loam, 35 to 50 percent north slopes. This deep, well drained soil is on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, Pacific madrone, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 47 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is dark brown loam about 11 inches thick. The upper 9 inches of the subsoil is yellowish red clay loam. The lower 30 inches is yellowish red and strong brown clay and dark brown clay loam. Depth to weathered bedrock ranges from 40 to 60 inches or more.

Included in this unit is about 15 percent Vannoy soils. Also included are small areas of Voorhies soil. The percentage of included soils varies from one area to another.

Permeability of this Manita soil is moderately slow. Available water capacity is about 5 to 12 inches. Water supplying capacity is 16 to 22 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, recreation, watershed, and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 110 for Douglas-fir, the potential production per acre is 5,880 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 58,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and the difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. The soil is also subject to slumping, especially where road cuts are made in the steeper areas. Slumping can be minimized by locating roads in the more gently sloping areas and by using properly designed road drainage systems.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of the lack of adequate moisture during the growing season. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIe, nonirrigated.

55F—Manita loam, 35 to 50 percent south slopes. This deep, well drained soil is on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, Pacific madrone, black oak, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 47 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of decomposed forest litter about 1/2 inch thick. The surface layer is dark reddish brown loam about 11 inches thick. The upper 9 inches of the subsoil is reddish brown clay loam. The lower 30 inches is reddish brown clay. Depth to weathered bedrock ranges from 40 to 60 inches or more.

Included in this unit are about 10 percent Vannoy soils and 5 percent Voorhies soils. The percentage of included soils varies from one area to another.

Permeability of this Manita soil is moderately slow. Available water capacity is about 5 to 12 inches. Water supplying capacity is 16 to 22 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, recreation, watershed, and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 109 for Douglas-fir, the potential production per acre is 5,820 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 56,900 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. It is also subject to slumping, especially where road cuts are made in the steeper areas. Slumping can be minimized by locating roads in the more gently sloping areas and by using properly designed road drainage systems.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of droughtiness. Seedling survival can be improved by providing shade for seedlings. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIe, nonirrigated.

56F—McMullin gravelly loam, 30 to 60 percent slopes. This shallow, somewhat excessively drained soil is on mountains and ridges. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 50 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface layer is dark brown gravelly loam about 7 inches thick. The subsoil is dark yellowish brown gravelly clay loam about 7 inches thick. Depth to fractured hard bedrock ranges from 12 to 20 inches.

Included in this unit is about 15 percent Witzel soils. Also included are small areas of Vermisa, Beekman, and Voorhies soils. The percentage of included soils varies from one area to another.

Permeability of this McMullin soil is moderate. Available water capacity is about 1.5 to 3 inches. Water supplying capacity is 12 to 14 inches. Effective rooting depth is 12 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for livestock grazing and wildlife habitat.

Livestock grazing.—The present vegetation in most areas is mainly Idaho fescue, Lemmon needlegrass, and wedgeleaf ceanothus. The production of vegetation suitable for livestock grazing is limited by droughtiness. Slope limits access by livestock and promotes overgrazing of the less sloping areas. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots.

Livestock grazing should also be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Use of mechanical treatment practices is not practical, because the slopes are steep.

This map unit is in capability subclass VIe, nonirrigated.

57—Newberg fine sandy loam. This deep, somewhat excessively drained soil is on flood plains. It formed in alluvium derived dominantly from granitic rock and altered sedimentary and extrusive igneous rock. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly Oregon ash, cottonwood, ponderosa pine, shrubs, and grasses. Elevation is 750 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 150 to 170 days.

Typically, the surface layer is dark brown fine sandy loam about 15 inches thick. The underlying material to a depth of 61 inches is dark yellowish brown sandy loam stratified with loamy sand and loamy fine sand stratified with fine sandy loam.

Included in this unit are about 10 percent Camas soils and 5 percent Evans and Wapato soils. Also included are small areas of soils that have a surface layer of sandy loam or gravelly sandy loam, a few areas of soils that have a dark colored surface layer that extends to a depth of 40 inches or more, and some small areas of soils that have a substratum of stratified sandy loam to gravelly coarse sand. The percentage of included soils varies from one area to another.

Permeability of this Newberg soil is moderately rapid to a depth of 24 inches and rapid below this depth. Available water capacity is about 5 to 8 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. This soil is subject to occasional, brief periods of flooding in winter and spring. Channeling and deposition are common along streambanks.

This unit is used mainly for irrigated hay and pasture, cultivated crops, and wildlife habitat. It is also used as homesites and for recreation.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitation is the hazard of flooding, which can be reduced by the use of embankments, dikes, and levees. Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most

suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Using management that maintains optimum vigor and quality of forage plants is a good practice. The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—This unit is poorly suited to homesite development. The main limitation is the hazard of flooding. Flooding can be controlled only by use of major flood control structures, which should be located above the expected flood level.

Recreation.--This unit is suited to recreational development. It is limited mainly by the hazard of flooding, which limits the use of this unit mainly to picnic areas and paths and trails.

This map unit is in capability subclass IIw, irrigated.

58F—Pearsoll-Rock outcrop complex, 20 to 60 percent slopes. This map unit is on mountainsides. Elevation is 750 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 50 percent Pearsoll extremely stony clay loam and 25 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 25 percent Dubakella soils. Also included are small areas of McMullin and Witzel soils that are underlain by altered sedimentary and extrusive igneous rock. The percentage of included soils varies from one area to another.

The Pearsoll soil is shallow and well drained. It formed in colluvium derived dominantly from serpentinite and peridotite. Typically, the surface layer is dark reddish brown extremely stony clay loam about 5 inches thick. The subsoil is reddish brown extremely cobbly clay about 9 inches thick. Serpentine bedrock is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of this Pearsoll soil is slow. Available water capacity is about 1 inch to 2.5 inches. Water supplying capacity is 9 to 12 inches. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is high.

Rock outcrop consists of areas of exposed bedrock. Runoff from these areas is very rapid.

This unit is used for livestock grazing, wildlife habitat, and recreation.

Livestock grazing.—The present vegetation in most areas is mainly wedgeleaf ceanothus, whiteleaf manzanita, Idaho fescue, and Lemmon needlegrass. The production of vegetation suitable for livestock grazing is limited by the low fertility of the soil and droughtiness. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

Slope limits access by livestock and promotes overgrazing of the less sloping areas. If the range is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Use of mechanical treatment practices is not practical because of the stony surface layer and steepness of slope.

Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce vegetation suitable for grazing.

This unit is limited for livestock watering ponds and other water impoundments because of the shallow depth to bedrock and steepness of slope.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and large stones on the surface. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

58G—Pearsoll-Rock outcrop complex, 60 to 90 percent slopes. This map unit is on highly dissected mountainsides. Elevation is 750 to 4,000 feet. The average annual precipitation is 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 50 percent Pearsoll extremely stony clay loam and 25 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 25 percent Dubakella soils. Also included are small areas of McMullin and

Witzel soils that are underlain by altered sedimentary and extrusive igneous bedrock. The percentage of included soils varies from one area to another.

The Pearsoll soil is shallow and well drained. It formed in colluvium derived dominantly from serpentinite and peridotite. Typically, the surface layer is dark reddish brown extremely stony clay loam about 5 inches thick. The subsoil is reddish brown extremely cobbly clay about 9 inches thick. Serpentine bedrock is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of this Pearsoll soil is slow. Available water capacity is about 1 inch to 2.5 inches. Water supplying capacity is 9 to 12 inches. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

Rock outcrop consists of areas of exposed bedrock. Runoff from these areas is very rapid.

This unit is used for wildlife habitat and recreation.

Livestock grazing.—The present vegetation in most areas is mainly wedgeleaf ceanothus, whiteleaf manzanita, Idaho fescue, and Lemmon needlegrass. The production of vegetation suitable for livestock grazing is limited by the low fertility of the soil and droughtiness. Steep slopes and the areas of Rock outcrop limit access by livestock. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and stones on the surface. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Roads.—Roadbuilding on this unit is limited by the highly dissected slopes and the fractured bedrock.

This map unit is in capability subclass VIIIs, nonirrigated.

59F—Perdin cobbly loam, 30 to 50 percent north slopes. This moderately deep, well drained soil is on mountains. It formed in colluvium derived dominantly from serpentinite or peridotite. Elevation is 3,600 to 5,500 feet. The average annual precipitation is about 40 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is dark reddish brown cobbly loam about 7 inches thick. The subsoil is dark reddish brown and dark brown gravelly clay loam about 17 inches thick. Weathered serpentine bedrock is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 10 percent Jayar and Woodseye soils and 5 percent Dubakella and Pearsoll soils. The percentage of included soils varies from one area to another.

Permeability of this Perdin soil is slow. Available water capacity is about 2.5 to 7 inches. Water supplying capacity is 10 to 15 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for wildlife habitat, watershed, and recreation. Some areas are used for livestock grazing.

The present vegetation in most areas is mainly Jeffrey pine, incense-cedar, greenleaf manzanita, sedges, and grasses. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

Woodland.—Most woodland areas are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of the low fertility of the soil, frost heaving, and droughtiness. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

Livestock grazing.—Livestock grazing should be managed to protect the soil from excessive erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and cobbles on the surface. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is capability subclass VIIe, nonirrigated.

60F—Perdin cobbly loam, 30 to 50 percent south slopes. This moderately deep, well drained soil is on mountains. It formed in colluvium derived dominantly from serpentinite and peridotite. Elevation is 4,000 to 5,500 feet. The average annual precipitation is about 40 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 2 inches thick. The surface layer is dark reddish brown cobbly loam about 7 inches thick. The subsoil is dark reddish brown and dark brown gravelly clay loam about 17 inches thick. Weathered serpentine bedrock is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 10 percent Woodseye soils, 5 percent Jayar soils, and 10 percent Dubakella and Pearsoll soils. The percentage of included soils varies from one area to another.

Permeability of this Perdin soil is slow. Available water capacity is about 2.5 to 7 inches. Water supplying capacity is 10 to 15 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for wildlife habitat, watershed, and recreation. Some areas are used for livestock grazing.

The present vegetation in most areas is mainly Jeffrey pine, incense-cedar, greenleaf manzanita, sedges, and grasses. The ultramafic rock from which the soils developed is very high in content of magnesium and very low in calcium, which limits plant growth.

Woodland.—Most woodland areas are considered to be impractical to manage because of the low site index and sparse stands; however, timber has been harvested in some areas.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of the low fertility of the soil, frost heaving, and droughtiness. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

Livestock grazing.—Livestock grazing should be managed to protect the soil from excessive erosion. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and cobbles on the surface. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIe, nonirrigated.

61B—Pollard loam, 2 to 7 percent slopes. This deep, well drained soil is on terraces, in saddles, and on hills. It formed in colluvium and alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, tanoak, hazel, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown loam about 3 inches thick. The next layer is reddish brown clay loam about 4 inches thick. The upper 29 inches of the subsoil is dark red and red clay. The lower 24 inches is red clay loam. Bedrock is at a depth of 60 inches or more.

Included in this unit are about 10 percent Abegg soils and 5 percent Selmac soils in depressional areas. Also included are small areas of soils, adjacent to Selmac soils, that have a dense clay layer below a depth of 40 inches. The percentage of included soils varies from one area to another.

Permeability of this Pollard soil is slow. Available water capacity is about 5.5 to 8 inches. Water supplying capacity is 16 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture, homesites, and timber production. It is also used for cultivated crops, wildlife habitat, and recreation.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitation is slow permeability in the subsoil.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Leveling also helps to insure the uniform application of water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are slow permeability in the subsoil and the potential for shrinking and swelling of the soil. Septic tank absorption fields may not function properly during rainy periods because of slow permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for this.

The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling

with material that has low potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Recreation.—If this unit is used for recreational development, the main limitation is dustiness when the soil is dry.

Woodland.—This unit is well suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 126 for Douglas-fir, the potential production per acre is 7,440 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 71,010 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Reforestation must be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Hand planting of nursery stock is usually necessary to establish or improve a stand, but machine planting is sometimes practical in dry years. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine. Tree seedlings have a high rate of survival.

This map unit is in capability subclasses IIe, irrigated, and IVe, nonirrigated.

61C—Pollard loam, 7 to 12 percent slopes. This deep, well drained soil is on terraces, in saddles, and on hills. It formed in colluvium and alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, tanoak, hazel, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown loam about 3 inches thick. The next layer is reddish brown clay loam about 4 inches thick. The upper 29 inches of the subsoil is dark red and red clay. The lower 24 inches is red clay loam. Bedrock is at a depth of 60 inches or more.

Included in this unit are about 10 percent Abegg soils and 5 percent Selmac soils in depressional areas. Also included are small areas of soils, adjacent to Selmac soils, that have a dense clay layer below a depth of 40 inches. The percentage of included soils varies from one area to another.

Permeability of this Pollard soil is slow. Available water capacity is about 5.5 to 8 inches. Water supplying capacity is 16 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture, homesites, and timber production. It is also used for cultivated crops, recreation, and wildlife habitat.

Hay and pasture.—This unit is well suited to irrigated hay and pasture. The main limitations are the hazard of erosion, steepness of slope, and slow permeability of the subsoil.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion. The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are slow permeability of the subsoil, steepness of slope, the potential for

shrinking and swelling of the soil, and low soil strength. Slope limits use of the steeper areas of this unit for building site development. The hazard of erosion is increased if the soil is left exposed during site development. Preserving as much of the existing plant cover as possible during construction helps to control erosion.

Septic tank absorption fields may not function properly during rainy periods because of slow permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for the slow permeability. Slope also is a concern in installing septic tank absorption fields. Absorption lines should be installed on the coutour.

The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low potential for shrinking and swelling. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and dustiness when the soil is dry.

Woodland.—This unit is well suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 126 for Douglas-fir, the potential production per acre is 7,440 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 71,010 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Minimizing the risk of erosion is essential in forest management.

Reforestation must be carefully managed to reduce competition from undesirable understory plants. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Hand planting of nursery stock is usually necessary to establish or improve a stand, but machine planting is sometimes practical in dry years. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine. Tree seedlings have a high rate of survival.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

61D—Pollard loam, 12 to 20 percent slopes. This deep, well drained soil is in saddles and on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, tanoak, hazel, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark reddish brown loam about 3 inches thick. The upper 12 inches of the subsoil is dark reddish brown clay loam, and the lower 45 inches is dark red clay. Bedrock is at a depth of 60 inches or more.

Included in this unit are about 10 percent Josephine soils, 5 percent Abegg soils, and 5 percent Selmac soils in depressional areas. Also included are small areas of soils, adjacent to Selmac soils, that have a dense clay layer below a depth of 40 inches and some small areas of Cornutt and Brockman soils. The percentage of included soils varies from one area to another.

Permeability of this Pollard soil is slow. Available water capacity is about 5.5 to 8 inches. Water supplying capacity is 16 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and irrigated hay and pasture. It is also used as homesites and for wildlife habitat, recreation, and watershed.

Woodland.—This unit is well suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 126 for Douglas-fir, the potential production per acre is 7,440 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 71,010 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are the hazard of erosion and difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are

suitable for planting are Douglas-fir, ponderosa pine, and sugar pine. Tree seedlings have a high rate of survival.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Hay and pasture.—This unit is suited to irrigated hay and pasture. The main limitations are the hazard of erosion and steepness of slope.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are steepness of slope and slow permeability of the subsoil. Slope limits use of the steeper areas of this unit for building site development. The hazard of erosion is increased if the soil is left exposed during site development. Preserving as much of the existing plant cover as possible during construction helps to control erosion.

Septic tank absorption fields may not function properly during rainy periods because of steepness of slope and slow permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for the slow permeability. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. The possibility of settlement can be minimized by compacting the building site before construction is begun.

Plans for homesite development should provide for the preservation of as many trees as possible. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

61E—Pollard loam, 20 to 35 percent slopes. This deep, well drained soil is on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, tanoak, hazel, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark reddish brown loam about 3 inches thick. The upper 12 inches of the subsoil is dark reddish brown clay loam. The lower 45 inches is dark red clay. Bedrock is at a depth of 60 inches or more.

Included in this unit are about 15 percent Josephine soils and 5 percent soils that are more than 35 percent rock fragments. Also included are small areas of Cornutt and Brockman soils and Pollard soils that have a gravelly loam surface layer. The percentage of included soils varies from one area to another.

Permeability of this Pollard soil is slow. Available water capacity is about 5.5 to 8 inches. Water supplying capacity is 16 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for timber production and as watershed. It is also used for dryland and irrigated hay and pasture, homesites, recreation, and wildlife habitat.

Woodland.—This unit is well suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 126 for Douglas-fir, the potential production per acre is 7,440 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 71,010 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are the hazard of erosion and difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine. Tree seedlings have a high rate of survival.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Homesites.—If this unit is used for homesite development, the main limitations are steepness of slope and slow permeability of the subsoil. Excavation for roads and buildings increases the hazard of erosion. Structures to divert runoff are needed if buildings and roads are constructed.

Septic tank absorption fields can be expected to function poorly on this unit because of slow permeability and steepness of slope.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

Hay and pasture.—If this unit is used for dryland hay and pasture, the main limitations are the hazard of erosion and steepness of slope. All tillage should be on the contour or across the slope. Terraces reduce runoff and the risk of erosion and help to conserve moisture.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

62F—Pollard gravelly loam, 35 to 50 percent slopes. This deep, well drained soil is on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, ponderosa pine, sugar pine, Pacific madrone, tanoak, hazel, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown and reddish brown gravelly loam about 20 inches thick. The upper 13 inches of the subsoil is yellowish red clay loam, and the lower 27 inches is yellowish red clay. Bedrock is at a depth of 60 inches or more.

Included in this unit are about 15 percent Josephine soils and 5 percent Speaker soils. Also included is about 10 percent soils that are more than 35 percent rock fragments. The percentage of included soils varies from one area to another.

Permeability of this Pollard soil is slow. Available water capacity is about 5.5 to 8 inches. Water supplying capacity is 16 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, wildlife habitat, and recreation.

Woodland.—This unit is well suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 116 for Douglas-fir, the potential production per acre is 6,480 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 59,040 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. The soil is also subject to slumping, especially where road cuts are made in the steeper areas. Slumping can be minimized by locating roads in the more gently sloping areas and by using properly designed road drainage systems.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts (fig. 11).

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of the lack of adequate moisture during the growing season. Seedling survival can be improved by providing shade in areas on south-facing slopes that are droughty in summer. Among the trees that are suitable for planting are Douglas-fir, ponderosa pine, and sugar pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.



Figure 11.—Area of Pollard gravelly loam, 35 to 50 percent slopes, that is seeded to permanent vegetation to prevent erosion.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIe, nonirrigated.

63F—Pollard-Beekman complex, 12 to 70 percent slopes. This map unit is on mountains. The native vegetation is mainly Douglas-fir, tanoak, Pacific madrone, hazel, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 45 percent Pollard gravelly loam and 35 percent Beekman very gravelly loam. Generally, Pollard soils are in the more gently sloping, concave areas and Beekman soils are in the steeper, convex areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Josephine soils, 5 percent Speaker soils, and 5 percent Colestine soils. Also included are small areas of Cornutt and Dubakella soils. The percentage of included soils varies from one area to another.

The Pollard soil is deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown and reddish brown gravelly loam about 20 inches thick. The upper 13 inches of the subsoil is yellowish red clay loam. The lower 27 inches is yellowish red clay. Bedrock is at a depth of 60 inches or more.

Permeability of the Pollard soil is slow. Available water capacity is about 5.5 to 8 inches. Water supplying capacity is 16 to 19 inches. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

The Beekman soil is moderately deep and well drained. It formed in colluvium derived dominantly from

altered sedimentary and extrusive igneous rock. Typically, the surface layer is very dark grayish brown very gravelly loam about 5 inches thick. The next layer is dark yellowish brown very gravelly loam about 9 inches thick. The subsoil is brown very gravelly loam about 11 inches thick. Fractured metamorphic bedrock is at a depth of 25 inches. Depth to unweathered bedrock ranges from 20 to 40 inches.

Permeability of the Beekman soil is moderate. Available water capacity is about 1 inch to 4.5 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, recreation, and wildlife habitat.

Woodland.—The Pollard soil is well suited to the production of Douglas-fir, sugar pine, and ponderosa pine. Based on a site index of 126 for Douglas-fir, the potential production per acre is 7,440 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 71,010 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The Beekman soil is also well suited to the production of Douglas-fir, ponderosa pine, and sugar pine. Based on a site index of 115 for Douglas-fir, the potential production per acre is 6,360 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 57,960 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, slumping of the soil and landslides, and difficulty of reforestation.

The soils in this unit are subject to slumping and landslides because they are underlain by highly fractured bedrock and are very plastic. Slumping mainly occurs where road cuts are made in the steeper areas. It can be minimized by locating roads in the more gently sloping areas and by using properly designed road drainage systems. Roads for year-round use need heavy base rock. Slumping and landsliding can also result from harvesting timber. Therefore, the method of logging and the kind of timber harvested should be selected so as to minimize the disturbance of the unit.

The soils in this unit are subject to compaction if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soils, and it restricts the growth of roots. Compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the soils are least susceptible to compaction. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of droughtiness, which is caused by coarse fragments in the soils. Mulching around seedlings helps to retain moisture in summer.

Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir, sugar pine, and ponderosa pine. In areas on south-facing slopes that are droughty in summer, seedling survival can be improved by providing shade for seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIIs, nonirrigated.

64—Riverwash. Riverwash is mainly barren alluvial land. It consists of gravel and cobbles and small areas of sand. Riverwash is exposed during periods of low water and is subject to channeling and deposition during normal periods of high water and at flood stage.

The unit is a potential source of sand and gravel. Most areas are limited for other uses.

This map unit is in capability subclass VIIIw.

65F—Rogue-Goodwin complex, 35 to 70 percent north slopes. This map unit is on mountains. The native vegetation is mainly white fir, Shasta red fir, rhododendron and other shrubs, forbs, and grasses. Elevation is 3,600 to 5,500 feet. The average annual precipitation is about 50 to 70 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

This unit is 60 percent Rogue stony coarse sandy loam and 25 percent Goodwin very stony sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent soils that are more than 60 inches deep to bedrock and 5 percent Bigelow and Crannler soils. Also included are small areas of Siskiyou and Tethrick soils. The percentage of included soils varies from one area to another.

The Rogue soil is deep and somewhat excessively drained. It formed in colluvium derived dominantly from

granitic rock. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown stony coarse sandy loam about 4 inches thick. The subsoil is dark yellowish brown and dark brown gravelly coarse sandy loam about 26 inches thick. The substratum is dark grayish brown and olive brown gravelly loamy coarse sand 26 inches thick. Grus derived from granodiorite is at a depth of 56 inches. Depth to weathered bedrock is 40 to 60 inches.

Permeability of the Rogue soil is moderately rapid. Available water capacity is about 2.5 to 6.5 inches. Water supplying capacity is 8 to 13 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high.

The Goodwin soil is deep and well drained. It formed in colluvium derived dominantly from granitic rock. Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs about 3 inches thick. The surface layer is very dark brown very stony sandy loam and dark brown very gravelly sandy loam about 16 inches thick. The subsoil is dark brown extremely gravelly sandy loam about 24 inches thick. The substratum is olive brown very gravelly sandy loam. Highly decomposed grus derived from granite is at a depth of 55 inches. Depth to weathered bedrock ranges from 40 to 60 inches.

Permeability of the Goodwin soil is moderately rapid. Available water capacity is about 3 to 6 inches. Water supplying capacity is 8 to 13 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used for timber production, watershed, wildlife habitat, and recreation.

Woodland.—The Rogue soil is well suited to the production of white fir and Shasta red fir. Based on a site index of 50 for Shasta red fir, the potential production per acre is 23,950 cubic feet from an even-aged, fully stocked stand of trees 140 years old or 156,000 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 130 years old.

The Goodwin soil is well suited to the production of white fir and Shasta red fir. Based on a site index of 50 for Shasta red fir, the potential production per acre is 23,950 cubic feet from an even-aged, fully stocked stand of trees 140 years old or 156,000 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 130 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation, steepness of slope, and the hazard of erosion. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soils in this unit are subject to compaction if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soils, and it restricts the growth of roots.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soils onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness and frost heaving. Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soils decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. Tree seedlings may not be able to replace the moisture they lose through transpiration when the soils are frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are white fir and Shasta red fir.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIe, nonirrigated.

66F—Rogue-Goodwin complex, 35 to 70 percent south slopes. This map unit is on mountains. The native vegetation is mainly white fir, Shasta red fir, rhododendron and other shrubs, forbs, and grasses. Elevation is 4,000 to 5,500 feet. The average annual precipitation is about 50 to 70 inches, the average

annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

This unit is 50 percent Rogue stony coarse sandy loam and 30 percent Goodwin very stony sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Bigelow soils, 5 percent Crannler soils, and 10 percent soils that are more than 60 inches deep to bedrock. Also included are small areas of Siskiyou and Tethrick soils. The percentage of included soils varies from one area to another.

The Rogue soil is deep and somewhat excessively drained. It formed in colluvium derived dominantly from granitic rock. Typically, the surface is covered with a mat of partially decomposed leaves, needles, and twigs about 1 inch thick. The surface layer is dark brown stony coarse sandy loam about 4 inches thick. The subsoil is dark yellowish brown and dark brown gravelly coarse sandy loam about 26 inches thick. The substratum is dark grayish brown and olive brown gravelly loamy coarse sand 26 inches thick. Grus derived from granite is at a depth of 56 inches. Depth to weathered bedrock ranges from 40 to 60 inches.

Permeability of the Rogue soil is moderately rapid. Available water capacity is about 2.5 to 6.5 inches. Water supplying capacity is 8 to 13 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high.

The Goodwin soil is deep and well drained. It formed in colluvium derived dominantly from granitic rock. Typically, the surface is covered with a mat of undecomposed leaves, needles, and twigs about 2 1/2 inches thick. The surface layer is very dark brown very stony sandy loam about 16 inches thick. The subsoil is dark yellowish brown and brown very gravelly sandy loam about 39 inches thick. Highly decomposed grus derived from granitic rock is at a depth of 55 inches. Depth to weathered bedrock is 40 to 60 inches.

Permeability of the Goodwin soil is moderately rapid. Available water capacity is about 3 to 6 inches. Water supplying capacity is 8 to 13 inches. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used for timber production, watershed, wildlife habitat, and recreation.

Woodland.—The Rogue soil is well suited to the production of white fir and Shasta red fir. Based on a site index of 40 for Shasta red fir, the potential production per acre is 18,950 cubic feet from an even-aged, fully stocked stand of trees 140 years old or 136,000 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 140 years old.

The Goodwin soil is well suited to the production of Shasta red fir and white fir. Based on a site index of 40 for Shasta red fir, the potential production per acre is 18,950 cubic feet or 136,000 board feet (International rule, one-eighth inch kerf). Production is estimated for an even-aged, fully stocked stand of trees 140 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soils in this unit are subject to compaction if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soils onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness and frost heaving. Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade for seedlings.

Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Because stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Shasta red fir and white fir.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope

and stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIe, nonirrigated.

67B—Ruch gravelly silt loam, 2 to 7 percent slopes. This deep, well drained soil is on foot slopes and alluvial fans. It formed in alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly ponderosa pine, Douglas-fir, black oak, Pacific madrone, shrubs, and grasses. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark brown gravelly silt loam about 5 inches thick. The next layer is brown gravelly loam about 7 inches thick. The subsoil is brown clay loam about 27 inches thick. The substratum to a depth of 60 inches or more is brown clay loam.

Included in this unit are about 10 percent Vannoy soils, 5 percent Abegg soils, 5 percent Kerby and Foehlin soils, and 5 percent soils that are more than 35 percent rock fragments. The percentage of included soils varies from one area to another.

Permeability of this Ruch soil is moderately slow. Available water capacity is about 7 to 10 inches. Water supplying capacity is 17 to 20 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture, other cultivated crops, homesites, and timber production. It is also used for wildlife habitat and recreation.

Hay and pasture.—This unit is well suited to hay and pasture. It has few limitations.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are the moderately slow permeability of the subsoil and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of moderately slow permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for this limitation.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Roads and streets can be built if they are designed to compensate for the limited capacity of the soil to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Woodland.—This unit is suited to the production of ponderosa pine and Douglas-fir. Based on a site index of 120 for ponderosa pine, the potential production per acre is 5,640 cubic feet from an even-aged, fully stocked stand of trees 40 years old or 54,320 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 70 years old.

The main concern in producing and harvesting timber is the difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are ponderosa pine and Douglas-fir. Tree seedlings have a low rate of survival because of the lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or

artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Minimizing the risk of erosion is essential in forest management. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

This map unit is in capability subclasses IIe, irrigated, and IVe, nonirrigated.

67C—Ruch gravelly silt loam, 7 to 12 percent slopes. This deep, well drained soil is on foot slopes and alluvial fans. It formed in alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly ponderosa pine, Douglas-fir, black oak, Pacific madrone, shrubs, and grasses. Elevation is 800 to 3,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 52 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is very dark grayish brown gravelly silt loam about 5 inches thick. The next layer is dark brown gravelly loam about 8 inches thick. The subsoil is brown gravelly loam and dark yellowish brown and brown gravelly clay loam about 35 inches thick. The substratum to a depth of 60 inches or more is brown gravelly loam.

Included in this unit are about 10 percent Vannoy soils on mountainsides, 5 percent Abegg soils, 5 percent Foehlin soils, and 5 percent soils that are more than 35 percent rock fragments. The percentage of included soils varies from one area to another.

Permeability of this Ruch soil is moderately slow. Available water capacity is about 7 to 10 inches. Water supplying capacity is 17 to 20 inches. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture, cultivated crops, homesites, and timber production. It is also used for wildlife habitat and recreation.

Hay and pasture.—This unit is well suited to hay and pasture. The main limitation is steepness of slope.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients.

Seedbed preparation should be on the contour or across the slope where practical. Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

The organic matter content can be maintained by using all crop residue, plowing under cover crops, and using a suitable cropping system. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

Seeding early in fall, stubble-mulch tillage, and construction of terraces, diversions, and grassed waterways help to control erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—If this unit is used for homesite development, the main limitations are the moderately slow permeability of the subsoil and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of the moderately slow permeability. Use of sandy backfill for the trench and long absorption lines helps to compensate for this limitation. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Roads and streets can be built if they are designed to compensate for the limited capacity of the soil to support a load. Access roads should be designed to provide adequate cut-slope grade, and drains are needed to control surface runoff and keep soil losses to a minimum.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

Woodland.—This unit is suited to the production of ponderosa pine and Douglas-fir. Based on a site index of 120 for ponderosa pine, the potential production per acre is 5,640 cubic feet from an even-aged, fully stocked stand of trees 40 years old or 54,320 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 70 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are ponderosa pine and Douglas-fir. Tree seedlings have a low rate of survival because of the lack of adequate moisture during the growing season.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Minimizing the risk of erosion is essential in forest management. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

68B—Selmac loam, 2 to 7 percent slopes. This deep, moderately well drained soil is in drainage basins. It formed in alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, black oak, Pacific madrone, poison-oak, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsoil is dark yellowish brown clay loam and reddish brown gravelly clay loam about 12 inches thick. The substratum to a depth of 60 inches or more is olive brown and olive gray clay.

Included in this unit is about 5 percent Abegg soils, 5 percent Pollard soils, and 5 percent Manita soils. The percentage of included soils varies from one area to another.

Permeability of this Selmac soil is very slow. Available water capacity is about 2 to 4 inches. Water supplying capacity is 11 to 15 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 18 to 36 inches in winter and spring. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly for irrigated hay and pasture, timber production, and homesites. It is also used for recreation and wildlife habitat.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by wetness and the very slow permeability of the substratum. Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is also needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Irrigation water needs to be applied carefully to prevent the development of a high water table, and drainage may also be needed.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Woodland.—This unit is poorly suited to the production of Douglas-fir, ponderosa pine, and incense-cedar. Based on a site index of 87 for Douglas-fir, the potential production per acre is 4,690 cubic feet from an even-aged, fully stocked stand of trees 70 years old or 38,280 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concern in producing and harvesting timber is the difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Minimizing the risk of erosion is essential in forest management.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Only trees that can tolerate seasonal wetness should be planted. Among the trees that are suitable for planting are ponderosa pine, incense-cedar, and Douglas-fir. Tree seedlings have only a moderate rate of survival because of intermittent wet and dry periods. Lack of adequate moisture during the growing season is also a concern.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Homesites.—If this unit is used for homesite development, the main limitations are wetness, the very slow permeability of the subsoil, and the potential for shrinking and swelling of the soil. Septic tank absorption fields can be expected to function poorly on this unit because of the very slow permeability and wetness.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. A seasonal high water table is perched above the claypan, and drainage should be provided for buildings with basements and crawl spaces. Wetness can be reduced by installing

drain tile around footings. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclasses IIIe, irrigated, and IVe, nonirrigated.

68D—Selmac loam, 7 to 20 percent slopes. This deep, moderately well drained soil is in drainage basins. It formed in alluvium derived dominantly from altered sedimentary and extrusive igneous rock. The vegetation in areas not cultivated is mainly Douglas-fir, ponderosa pine, black oak, Pacific madrone, poison-oak, and grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsoil is dark yellowish brown clay loam about 12 inches thick. The substratum to a depth of 60 inches or more is brown clay.

Included in this unit are about 10 percent Pollard soils and 10 percent Manita soils. Also included are small areas of Abegg soils. The percentage of included soils varies from one area to another.

Permeability of this Selmac soil is very slow. Available water capacity is about 2 to 4 inches. Water supplying capacity is 11 to 15 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 18 to 36 inches in winter and spring. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay and pasture, timber production, and homesites. It is also used for recreation and wildlife habitat.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by wetness and very slow permeability. Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is also needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Irrigation water needs to be applied carefully to prevent the development of a high water table, and drainage may also be needed.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Seeding early in fall and construction of terraces, diversions, and grassed waterways help to control erosion. Proper stocking rates, pasture rotation, and restricted grazing during wet periods also help to protect the soil from erosion and to keep the pasture in good condition. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Woodland.—This unit is poorly suited to the production of Douglas-fir, ponderosa pine, and incense-cedar. Based on a site index of 87 for Douglas-fir, the potential production per acre is 4,690 cubic feet from an even-aged, fully stocked stand of trees 70 years old or 38,780 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are the difficulty of reforestation and the hazard of erosion. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Minimizing the risk of erosion is essential in forest management.

Reforestation must be carefully managed. Hand planting of nursery stock is usually necessary to establish or improve a stand. Only trees that can tolerate seasonal wetness should be planted. Among the trees that are suitable for planting are ponderosa pine, Douglas-fir, and incense-cedar. Tree seedlings have only a moderate rate of survival because of intermittent wet and dry periods. Lack of adequate moisture during the growing season is also a concern.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Homesites.—If this unit is used for homesites, the main limitations are wetness, very slow permeability, the potential for shrinking and swelling of the soil, and steepness of slope. Septic tank absorption fields can be expected to function poorly on this unit because of the very slow permeability and wetness.

If buildings are constructed on this unit, properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. A seasonal high water table is perched above the claypan, and drainage should be provided for buildings with basements and crawl spaces. Wetness can be reduced by installing drain tile around footings. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. Excavation for roads and buildings increases the hazard of erosion.

Plans for homesite development should provide for the preservation of as many trees as possible. Erosion and

sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. It is difficult to establish plants in areas where the surface layer has been removed. Topsoil can be stockpiled and used to reclaim these areas. Mulching and fertilizing cut areas help to establish plants.

This map unit is in capability subclass IVe, nonirrigated and irrigated.

69E—Siskiyou gravelly sandy loam, 20 to 35 percent slopes. This moderately deep, somewhat excessively drained soil is on hills. It formed in colluvium derived dominantly from granitic rock. The native vegetation is mainly ponderosa pine, Douglas-fir, sugar pine, Pacific madrone, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 50 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of needles and twigs about 1 inch thick. The surface layer is dark brown gravelly sandy loam about 4 inches thick. The subsoil is dark grayish brown and brown sandy loam about 22 inches thick. The substratum is brown sandy loam about 10 inches thick. Highly weathered granitic bedrock is at a depth of 36 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 10 percent Holland soils, 10 percent Pollard and Manita soils, and 5 percent Tethrick soils. The percentage of included soils varies from one area to another.

Permeability of this Siskiyou soil is moderately rapid. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used mainly for timber production. It is also used as watershed and for wildlife habitat, recreation, and some livestock grazing.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 101 for Douglas-fir, the potential production per acre is 5,100 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 47,800 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots.

Minimizing the risk of erosion is essential in forest management. Excessive erosion occurs if the surface layer is disturbed or removed and protection of the soil is not provided. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. In areas on south-facing slopes that are droughty, seedling survival can be improved by providing shade. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Livestock grazing.—Livestock grazing should be managed to protect the soil from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce vegetation suitable for grazing. Management practices suitable for use on this unit are proper range use, deferred grazing, rotation grazing, and aerial spraying for brush management.

This map unit is in capability subclass VIe, nonirrigated.

70F—Siskiyou gravelly sandy loam, 35 to 70 percent north slopes. This moderately deep, somewhat excessively drained soil is on mountains. It formed in colluvium derived dominantly from granitic rock. The native vegetation is mainly ponderosa pine, Douglas-fir, sugar pine, Pacific madrone, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 50 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of needles and twigs about 1 inch thick. The surface layer is dark brown gravelly sandy loam about 4 inches thick. The subsoil is dark grayish brown and brown sandy loam

about 22 inches thick. The substratum is brown sandy loam about 10 inches thick. Highly weathered granite is at a depth of 36 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 10 percent Tethrick soils, 10 percent soils that are similar to this Siskiyou soil but are less than 20 inches deep, and 5 percent Holland soils. Also included are small areas of Pollard and Manita soils. The percentage of included soils varies from one area to another.

Permeability of this Siskiyou soil is moderately rapid. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used mainly for timber production. It is also used as watershed and for recreation and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 101 for Douglas-fir, the potential production per acre is 5,100 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 47,800 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Minimizing the risk of erosion is essential in forest management. Excessive erosion occurs if the surface layer is disturbed or removed and protection of the soil is not provided. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIe, nonirrigated.

71F—Siskiyou gravelly sandy loam, 35 to 60 percent south slopes. This moderately deep, somewhat excessively drained soil is on mountains. It formed in colluvium derived dominantly from granitic rock. The native vegetation is mainly ponderosa pine, Douglas-fir, sugar pine, Pacific madrone, shrubs, and grasses. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 50 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface layer is very dark grayish brown gravelly sandy loam about 4 inches thick. The subsoil is dark brown and dark yellowish brown sandy loam about 15 inches thick. The substratum is yellowish brown sandy loam about 17 inches thick. Weathered granodiorite is at a depth of 36 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 10 percent Tethrick soils, 10 percent soils that are similar to this Siskiyou soil but are less than 20 inches deep, and 5 percent Holland soils. Also included are small areas of Pollard and Manita soils. The percentage of included soils varies from one area to another.

Permeability of this Siskiyou soil is moderately rapid. Available water capacity is about 1.5 to 4 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is high.

This unit is used mainly for timber production. It is also used for wildlife habitat, recreation, and watershed.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 90 for Douglas-fir, the potential production per acre is 4,200 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 41,030 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting

timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Minimizing the risk of erosion is essential in forest management. Excessive erosion occurs if the surface layer is disturbed or removed and protection of the soil is not provided. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Trees are subject to windthrow because of limited rooting depth.

This map unit is in capability subclass VIe, nonirrigated.

72F—Speaker-Josephine gravelly loams, 35 to 55 percent south slopes. This map unit is on mountains. The native vegetation is mainly Douglas-fir, ponderosa pine, Pacific madrone, California black oak, shrubs, forbs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 55 percent Speaker gravelly loam and 30 percent Josephine gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Pollard soils, 5 percent Beekman and Colestine soils, and 5 percent soils that are similar to Speaker and Josephine soils but are more than 35 percent rock fragments. Also included are small areas of Rock outcrop and Cornutt and Dubakella soils. The percentage of included components varies from one area to another.

The Speaker soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark brown gravelly loam about 6 inches thick. The upper 7 inches of the subsoil is reddish brown gravelly loam. The lower 17 inches is yellowish red gravelly clay loam. Weathered metamorphic bedrock is at a depth of 30 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is about 2.5 to 6.5 inches. Water supplying capacity is 13 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Josephine soil is deep and well drained. It formed in colluvium and residuum derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface is covered with a mat of partially decomposed needles and twigs about 2 inches thick. The surface layer is dark brown gravelly loam about 5 inches thick. The upper 8 inches of the subsoil is reddish brown gravelly loam. The lower 28 inches is yellowish red gravelly clay loam. Weathered metamorphic bedrock is at a depth of 41 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Josephine soil is moderately slow. Available water capacity is about 4.5 to 12 inches. Water supplying capacity is 15 to 20 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production. It is also used for watershed, wildlife habitat, and recreation.

Woodland.—The Speaker soil is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 113 for Douglas-fir, the potential production per acre is 6,180 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 61,900 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The Josephine soil is also well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 121 for Douglas-fir, the potential production per acre is 6,960 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 65,070 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and

to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some slumping of the soils onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend the logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soils in this unit are subject to compaction if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soils, and it restricts the growth of roots. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soils decreases seedling survival. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIe, nonirrigated.

73—Takilma cobbly loam. This deep, well drained soil is on low stream terraces. It formed in cobbly alluvium derived dominantly from metavolcanic, sedimentary, and ultramafic rock. Slope is 0 to 3 percent. The vegetation in areas not cultivated is mainly scattered oaks, shrubs, and grasses. Elevation is 800 to 2,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is dark brown cobbly loam about 6 inches thick. The subsoil is dark brown very cobbly loam about 12 inches thick. The substratum to a depth of 60 inches or more is dark brown extremely cobbly sandy loam.

Included in this unit are about 10 percent Kerby soils, 5 percent Foehlin soils on low stream terraces, 5 percent Abegg soils on the higher stream terraces, and 5 percent Camas soils on flood plains. Also included are small areas of Foehlin Variant soils in drainageways and Takilma soils that have a surface layer of gravelly and very gravelly loam. The percentage of included soils varies from one area to another.

Permeability of this Takilma soil is moderately rapid. Available water capacity is about 2.5 to 4.5 inches. Water supplying capacity is 12 to 15 inches. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight.

This map unit is used mainly for hay and pasture. It is also used as homesites.

Hay and pasture.—This unit is suited to hay and pasture. The main limitations are droughtiness and large stones on the surface, which limit the use of equipment on this unit.

Crops that are tolerant of drought are best suited to this unit because the available moisture is not adequate for good growth of most other crops. In summer, irrigation is required for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Because the soil in this unit is droughty, light and frequent applications of water are needed.

Successful establishment and proper distribution of seedlings can be insured by drilling the seed. Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed for optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to phosphorus and sulfur.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

This unit is limited for livestock watering ponds and other water impoundments because of seepage.

Homesites.—If this unit is used for homesite development, the main limitation is cobbles. Use of the soil in this unit for septic tank absorption fields is limited because the extremely gravelly substratum is a poor filter and there is a hazard of polluting water supplies. If the density of housing is moderate to high, community sewage systems are needed.

The use of equipment on this unit is limited by cobbles throughout the soil. Removal of pebbles and cobbles in disturbed areas is required for best results when landscaping, particularly in areas used for lawns. Selection of adapted vegetation is critical for the establishment of lawns, shrubs, trees, and vegetable gardens. In summer, irrigation is required for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

Recreation.—Cobbles in the surface layer limit this unit for some recreational uses.

This map unit is in capability subclass IVs, irrigated and nonirrigated.

74—Takilma Variant extremely cobbly loam. This deep, well drained soil is on low stream terraces. It formed in alluvium derived dominantly from serpentinite and peridotite. Slope is 0 to 3 percent. The native vegetation is mainly scattered Jeffrey pine, Douglas-fir, incense-cedar, whiteleaf manzanita, Idaho fescue, and Lemmon needlegrass. Elevation is 1,400 to 1,550 feet. The average annual precipitation is about 50 to 60 inches, the average annual air temperature is 50 to 52 degrees F, and the average frost-free period is 140 to 170 days.

Typically, the surface layer is strong brown extremely cobbly loam about 5 inches thick. The subsoil is yellowish red extremely cobbly loam about 13 inches thick. The upper 10 inches of the substratum is brown extremely cobbly sandy clay loam. The lower part to a depth of 63 inches is strong brown and dark brown extremely cobbly loamy coarse sand.

Included in this unit is about 5 percent soils that are sandy throughout and are on flood plains. The percentage of included soils varies from one area to another.

Permeability of this Takilma Variant soil is moderate to a depth of 28 inches and rapid below this depth. Available water capacity is about 2.5 to 4 inches. Water supplying capacity is 11 to 13 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for wildlife habitat, recreation, livestock grazing, and homesites.

Livestock grazing.—The production of vegetation is limited by the low fertility of the soil and droughtiness. The ultramafic rock from which the soil developed is very high in content of magnesium and very low in calcium, which limits plant growth.

Homesites.—This unit is suited to homesite development. The main limitations are the rapid permeability of the substratum, cobbles, and unstable cutbanks that are subject to slumping. During the rainy season, effluent from onsite sewage disposal systems may pollute ground water supplies.

Plans for homesite development should provide for the preservation of as many trees as possible. Removal of pebbles and cobbles in disturbed areas is needed for best results when landscaping, particularly in areas used for lawns. In summer, irrigation is needed for lawn grasses, shrubs, vines, shade trees, and ornamental trees.

Recreation.—If this unit is used for recreational development, the main limitation is stones. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIs, nonirrigated.

75F—Tethrick gravelly fine sandy loam, 45 to 70 percent north slopes. This deep, well drained soil is on mountains. It formed in colluvium derived dominantly from granitic rock. The native vegetation is mainly Douglas-fir, white fir, Pacific madrone, incense-cedar, Port-Orford-cedar, chinkapin, tall Oregon-grape, and beargrass. Elevation is 1,200 to 4,000 feet. The average annual precipitation is about 40 to 60 inches, the average annual air temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

Typically, the surface is covered with a mat of needles, leaves, twigs, and bark about 1/2 inch thick. The surface layer is very dark grayish brown gravelly fine sandy loam about 9 inches thick. The subsoil is dark grayish brown fine sandy loam about 21 inches thick. The substratum is olive fine sandy loam about 23 inches thick and is underlain by highly decomposed quartz-diorite. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 10 percent Siskiyou soils and 5 percent Rogue soils. Also included are small areas of Holland soils. The percentage of included soils varies from one area to another.

Permeability of this Tethrick soil is moderate. Available water capacity is about 6 to 11 inches. Water supplying capacity is 17 to 21 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production. It is also used as watershed and for recreation and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 105 for Douglas-fir, the potential production per acre is 6,450 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 52,400 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and the difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Minimizing the risk of erosion is essential in forest management. Excessive erosion occurs if the surface layer is disturbed or removed and protection of the soil is not provided. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and

to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIe, nonirrigated.

76F—Tethrick gravelly fine sandy loam, 45 to 65 percent south slopes. This deep, well drained soil is on mountainsides. It formed in colluvium derived dominantly from granitic rock. The native vegetation is mainly Douglas-fir, white fir, Pacific madrone, incense-cedar, Port-Orford-cedar, chinkapin, tall Oregon-grape, and beargrass. Elevation is 1,200 to 4,000 feet. The average annual precipitation is about 40 to 60 inches, the average annual air temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 160 days.

Typically, the surface is covered with a mat of needles and twigs about 1 inch thick. The surface layer is very dark grayish brown gravelly fine sandy loam about 9 inches thick. The subsoil is brown fine sandy loam about 22 inches thick. The substratum is olive sandy loam about 22 inches thick and is underlain by weathered quartz-diorite. Depth to bedrock ranges from 40 to 60 inches.

Included in this unit are about 15 percent Siskiyou soils and 5 percent Rogue soils. Also included are small areas of Holland soils. The percentage of included soils varies from one area to another.

Permeability of this Tethrick soil is moderate. Available water capacity is about 6 to 11 inches. Water supplying capacity is 17 to 21 inches. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production. It is also used as watershed and for recreation and wildlife habitat.

Woodland.—This unit is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 95 for Douglas-fir, the potential production per acre is 4,620 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 46,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and the difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Minimizing the risk of erosion is essential in forest management. Excessive erosion occurs if the surface layer is disturbed or removed and protection of the soil is not provided. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material. Some sloughing of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade. Hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Trees are subject to windthrow because of limited rooting depth.

This map unit is in capability subclass VIe, nonirrigated.

77E—Vannoy silt loam, 20 to 35 percent slopes. This moderately deep, well drained soil is on hillsides. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, California black oak, ponderosa pine, Pacific madrone, sugar pine, incense-

cedar, canyon live oak, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of partially decomposed needles and twigs about 1 inch thick. The surface layer is dark brown silt loam about 7 inches thick. The upper 17 inches of the subsoil is yellowish red and reddish brown clay loam. The lower 5 inches is yellowish red gravelly clay loam. Highly weathered metamorphic bedrock is at a depth of 29 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 15 percent Manita soils, 5 percent Ruch soils, and 5 percent Voorhies soils. The percentage of included soils varies from one area to another.

Permeability of this Vannoy soil is moderately slow. Available water capacity is about 3 to 7.5 inches. Water supplying capacity is 14 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for timber production. It is also used for some livestock grazing, wildlife habitat, recreation, and watershed.

Woodland.—This unit is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 110 for Douglas-fir, the potential production per acre is 5,880 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 58,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are steepness of slope, the difficulty of reforestation, and the hazard of erosion. Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Conventional methods of harvesting timber generally are suitable, but the soil may be compacted if it is wet when heavy equipment is used. Compaction can be reduced by using suitable methods of harvesting timber, laying out skid trails in advance, and harvesting timber when the soil is least susceptible to compaction. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants on the soil.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of a lack of adequate moisture during the growing season. Hand planting of nursery stock is usually necessary to establish or improve a stand. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIe, nonirrigated.

78F—Vannoy silt loam, 35 to 55 percent north slopes. This moderately deep, well drained soil is on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, California black oak, ponderosa pine, Pacific madrone, sugar pine, incense-cedar, canyon live oak, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 170 days.

Typically, the surface is covered with a mat of partially decomposed needles and twigs about 1 inch thick. The surface layer is dark brown silt loam about 7 inches thick. The upper 17 inches of the subsoil is yellowish red and reddish brown clay loam. The lower 5 inches is yellowish red gravelly clay loam. Highly weathered metamorphic bedrock is at a depth of 29 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are about 15 percent Manita soils and 10 percent Voorhies soils. Also included are small areas of Cornutt and Dubakella soils. The percentage of included soils varies from one area to another.

Permeability of this Vannoy soil is moderately slow. Available water capacity is about 3 to 7.5 inches. Water supplying capacity is 14 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production. Some areas are also used for livestock grazing, watershed, recreation, and wildlife habitat.

Woodland.—This unit is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 110 for Douglas-fir, the potential production per acre is 5,880 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 58,100 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the

difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some slumping of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber.

The soil in this unit is subject to compaction if it is wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soil, and it restricts the growth of roots. When the soil is dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have only a moderate rate of survival because of a lack of adequate moisture during the growing season. Hand planting of nursery stock is usually necessary to establish or improve a stand. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIe, nonirrigated.

79F—Vannoy-Voorhies complex, 35 to 55 percent south slopes. This map unit is on mountainsides. The native vegetation is mainly Douglas-fir, black oak, ponderosa pine, Pacific madrone, sugar pine, canyon live oak, poison-oak, shrubs, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 30 to 35 inches, the average annual air temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 40 percent Vannoy silt loam and 35 percent Voorhies very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent Vermisa soils, 5 percent Manita soils, and 5 percent Beekman and Colestine soils. Also included are small areas of Cornutt and Dubakella soils. The percentage of included soils varies from one area to another.

The Vannoy soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark brown silt loam about 5 inches thick. The next layer is dark brown loam about 9 inches thick. The subsoil is brown and yellowish red clay loam about 19 inches thick. Highly fractured, weathered bedrock is at a depth of 33 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of this Vannoy soil is moderately slow. Available water capacity is about 3 to 7.5 inches. Water supplying capacity is 14 to 18 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

The Voorhies soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is very dark grayish brown and dark grayish brown very gravelly loam about 15 inches thick. The upper 7 inches of the subsoil is dark grayish brown very cobbly loam. The lower 14 inches is dark yellowish brown very gravelly clay loam. Fractured metamorphic bedrock is at a depth of 36 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of this Voorhies soil is moderate. Available water capacity is about 1.5 to 6 inches. Water supplying capacity is 12 to 17 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production. It is also used for wildlife habitat, recreation, and watershed.

Woodland.—The Vannoy soil is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 105 for Douglas-fir, the potential production per acre is 5,460 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 52,400 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The Voorhies soil is also suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 90 for Douglas-fir, the potential production per acre is 4,200 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 41,030 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation. Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some slumping of the soils onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

The soils in this unit are subject to compaction if they are wet when heavy equipment is used. Soil compaction limits the movement of air and water in the soils, and it restricts the growth of roots. When the soils are dry, skid trails and landings can be ripped to improve the growth of plants.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade. Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

This map unit is in capability subclass VIs, nonirrigated.

80G—Vermisa-Beekman complex, 60 to 100 percent north slopes. This map unit is on mountainsides. The native vegetation is mainly Douglas-fir, Pacific madrone, California black oak, canyon live oak, greenleaf manzanita, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 50 percent Vermisa extremely gravelly loam and 30 percent Beekman gravelly loam. The Vermisa soil generally is in the steeper areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Speaker and Josephine soils, 5 percent Colestine soils, and 5 percent Rock outcrop. Also included are small areas of Dubakella and Pearsoll soils and soils that have rock fragments 1 inch to 6 inches in diameter on the surface. The percentage of included components varies from one area to another.

The Vermisa soil is shallow and somewhat excessively drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark yellowish brown extremely gravelly loam about 3 inches thick. The subsoil is strong brown very gravelly loam about 12 inches thick. Fractured metavolcanic bedrock is at a depth of 15 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Vermisa soil is moderately rapid. Available water capacity is about 1 inch to 2.5 inches. Water supplying capacity is 10 to 12 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

The Beekman soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is very dark grayish brown gravelly loam about 5 inches thick. The next layer is dark yellowish brown very gravelly loam about 9 inches thick. The subsoil is brown very gravelly loam about 11 inches thick. Fractured metamorphic bedrock is at a depth of 25 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Beekman soil is moderate. Available water capacity is about 1 inch to 4.5 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and recreation. It is also used for wildlife habitat and as watershed.

Woodland.—The Vermisa soil is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 70 for Douglas-fir, the potential production per acre is 3,220 cubic feet from an even-aged, fully stocked stand of trees 70 years old or 24,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The Beekman soil is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 115 for Douglas-fir, the potential production per acre is 6,360 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 57,960 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 90 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more

conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some sloughing of the soils onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soils decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Trees are subject to windthrow because of limited rooting depth.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope, the hazard of erosion, and small stones on the surface. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

81G—Vermisa-Beekman complex, 60 to 100 percent south slopes. This map unit is on mountainsides. The native vegetation is mainly Douglas-fir, Pacific madrone, black oak, canyon live oak, greenleaf manzanita, and grasses. Elevation is 1,000 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 60 percent Vermisa extremely gravelly loam and 25 percent Beekman gravelly loam. The Vermisa soil generally is in the steeper areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Rock outcrop and 5 percent Colestine soils. Also included are small areas of Dubakella, Pearsoll, and Josephine soils and soils that have rock fragments 1 inch to 6 inches in diameter on the surface. The percentage of included components varies from one area to another.

The Vermisa soil is shallow and somewhat excessively drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark yellowish brown extremely gravelly loam about 3 inches thick. The subsoil is strong brown very gravelly loam about 12 inches thick. Fractured metavolcanic bedrock at a depth of 15 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Vermisa soil is moderately rapid. Available water capacity is about 1 inch to 2.5 inches. Water supplying capacity is 10 to 12 inches. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

The Beekman soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is very dark grayish brown gravelly loam about 5 inches thick. The next layer is dark yellowish brown very gravelly loam about 9 inches thick. The subsoil is brown very gravelly loam about 11 inches thick. Fractured metamorphic bedrock is at a depth of 25 inches. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Beekman soil is moderate. Available water capacity is about 1 inch to 4.5 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used mainly for timber production and recreation. It is also used for wildlife habitat and as watershed.

Woodland.—The Vermisa soil is suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 70 for Douglas-fir, the potential production per acre is 3,220 cubic feet from an even-aged, fully stocked stand of trees 70 years old or 24,200 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The Beekman soil is well suited to the production of Douglas-fir and ponderosa pine. Based on a site index of 105 for Douglas-fir, the potential production per acre is 5,460 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 52,400 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are steepness of slope, the hazard of erosion, and the difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging or other cable logging systems that fully or partially suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some sloughing of the soils onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of a lack of adequate moisture during the growing season. Droughtiness caused by coarse fragments in the soils decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade. Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and ponderosa pine.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Trees are subject to windthrow because of limited rooting depth.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope, the hazard of erosion, and small stones on the surface. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This unit is in capability subclass VIIs, nonirrigated.

82G—Vermisa-Rock outcrop complex, 60 to 100 percent south slopes. This map unit is on mountainsides. Elevation is 750 to 4,000 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 100 to 160 days.

This unit is 50 percent Vermisa extremely gravelly loam and 30 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent talus slopes and soils that have rock fragments 1 inch to 6 inches in diameter on the surface, and 5 percent Dubakella and Pearsoll soils. Also included are areas of soils that have north-facing slopes. The percentage of included components varies from one area to another.

The Vermisa soil is shallow and somewhat excessively drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark yellowish brown extremely gravelly loam about 3 inches thick. The subsoil is strong brown very gravelly loam about 12 inches thick. Hard bedrock is at a depth of 15 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of this Vermisa soil is moderately rapid. Available water capacity is about 1 inch to 2.5 inches. Water supplying capacity is 10 to 12 inches. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

Rock outcrop consists of areas of exposed bedrock. Runoff from these areas is very rapid.

This unit is used as watershed and for wildlife habitat, recreation, and livestock grazing.

Livestock grazing.—The present vegetation in most areas is mainly canyon live oak, Douglas-fir, shrubs, and grasses. The production of vegetation is limited by droughtiness. Livestock grazing should be managed to protect the unit from excessive erosion. Slope limits access by livestock and promotes overgrazing of the less sloping areas.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope and small stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIIs, nonirrigated.

83—Wapato silt loam. This deep, poorly drained soil is on bottom lands and in basinlike areas. It formed in alluvium derived dominantly from altered sedimentary and extrusive igneous rock. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly shrubs, sedges, rushes, and grasses. Elevation is 800 to 2,500

feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 150 to 170 days.

Typically, the surface layer is very dark grayish brown silt loam and silty clay loam about 17 inches thick. The upper 25 inches of the subsoil is dark gray and dark grayish brown silty clay loam. The lower part to a depth of 60 inches or more is grayish brown silty clay.

Included in this unit is about 10 percent Cove, Evans, and Newberg soils. Also included are small areas of Banning soils. The percentage of included soils varies from one area to another.

Permeability of this Wapato soil is moderately slow. Available water capacity is about 9 to 10 inches. Water supplying capacity is 15 to 18 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 0 to 12 inches in spring and winter. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to frequent, brief periods of flooding in winter and spring.

This unit is used mainly for irrigated hay and pasture, wildlife habitat, and recreation. It is also used as homesites.

Hay and pasture.—This unit is suited to irrigated hay and pasture. It is limited mainly by the hazard of flooding and wetness. The risk of flooding can be reduced by the use of embankments, dikes, and levees. Seeding early in fall, stubble-mulch tillage, and construction of diversions and grassed waterways help to control erosion caused by flooding.

Drainage is needed for maximum production of crops. Tile drainage can be used to lower the water table if a suitable outlet is available.

In summer, irrigation is also needed for maximum production of most crops. Sprinkler irrigation is the most suitable method of applying water. Applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs to avoid overirrigating and leaching of plant nutrients. Leveling helps to insure the uniform application of water.

Using management that maintains optimum vigor and quality of forage plants is a good practice. Fertilizer is needed to insure optimum growth of grasses and legumes. Grasses respond to nitrogen, and legumes respond to sulfur and phosphorus.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Periodic mowing and clipping promote uniform growth, discourage selective grazing, and reduce clumpy growth.

Homesites.—This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and wetness. Flooding can be controlled only by use of major flood control structures, which should be located above the expected flood level. Roads and streets can be built if they are designed to compensate for the limited ability of the soil in this unit to support a load.

Recreation.—This unit is poorly suited to recreational development. It is limited mainly by the hazard of flooding and wetness. The risk of flooding limits the use of this unit mainly to picnic areas and paths and trails. Drainage should be provided for paths and trails, and protection from flooding is needed.

This map unit is in capability subclass IIIw, irrigated.

84F—Witzel-Rock outcrop complex, 30 to 75 percent slopes. This map unit is on mountains. Elevation is 800 to 4,000 feet. The average annual precipitation is about 30 to 60 inches, the average annual air temperature is 45 to 54 degrees F, and the average frost-free period is 100 to 170 days.

This unit is 70 percent Witzel very cobbly loam and 20 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent Beekman soils and 5 percent McMullin soils. The percentage of included soils varies from one area to another.

The Witzel soil is shallow and well drained. It formed in colluvium and residuum derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface layer is dark brown very cobbly loam about 7 inches thick. The subsoil is dark reddish brown extremely cobbly clay loam about 7 inches thick. Partially weathered, fractured bedrock is at a depth of 14 inches. Depth to bedrock ranges from 12 to 20 inches.

Permeability of the Witzel soil is moderately slow. Available water capacity is about 1 inch to 3 inches. Water supplying capacity is 10 to 12 inches. Effective rooting depth is 12 to 20 inches. Runoff is rapid, and the hazard of water erosion is high.

Rock outcrop consists of areas of exposed bedrock. Runoff from these areas is very rapid.

This unit is used for livestock grazing, recreation, and wildlife habitat.

Livestock grazing.—The present vegetation in most areas is mainly Oregon white oak, poison-oak, Douglas-fir, wedgeleaf ceanothus, and grasses. The production of vegetation suitable for livestock grazing is limited by droughtiness.

If this unit is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Livestock grazing should be managed to protect the unit from excessive erosion. Slope limits access by livestock and promotes overgrazing of the less sloping areas. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing. Management practices suitable for use on this unit are proper range

use, deferred grazing, and rotation grazing. Use of mechanical treatment practices is not practical, because the surface is very cobbly and the slopes are steep.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope, the hazard of erosion, large stones on the surface, and the shallow depth to rock. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

85G—Woodseye very gravelly loam, 50 to 90 percent south slopes. This shallow, well drained soil is on mountains. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. The native vegetation is mainly Douglas-fir, white fir, Shasta red fir, greenleaf manzanita, snowbrush ceanothus, and grasses. Elevation is 4,000 to 5,500 feet. The average annual precipitation is about 40 to 60 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

Typically, the surface is covered with a mat of partially decomposed leaves and needles about 2 inches thick. The surface layer is very dark brown very gravelly loam about 8 inches thick. The upper part of the subsoil is dark brown very cobbly loam about 3 inches thick. The lower part, to a depth of 18 inches, is dark brown extremely stony loam. Hard metavolcanic bedrock is at a depth of 18 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Included in this unit is about 15 percent Jayar soils and 10 percent Rock outcrop. The percentage of included components varies from one area to another.

Permeability of this Woodseye soil is moderate. Available water capacity is about 0.5 inch to 2 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is high.

This unit is used as watershed and for wildlife habitat, timber production, and recreation.

Woodland.—This unit is poorly suited to the production of Douglas-fir and white fir. Based on a site index of 80 for Douglas-fir, the potential production per acre is 4,060 cubic feet from an even-aged, fully stocked stand of trees 70 years old or 32,010 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and the difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soil increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some slumping of the soil onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness. Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. A nurse crop can be used to protect tree seedlings from damage caused by high temperatures and hot winds. Seedling survival can be improved by providing shade. Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Among the trees that are suitable for planting are Douglas-fir and white fir. Trees are subject to windthrow because of limited rooting depth.

Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

86G—Woodseye-Jayar complex, 50 to 90 percent north slopes. This map unit is on mountains. The native vegetation is mainly Douglas-fir, white fir, Shasta red fir, rhododendron, and beargrass. Elevation is 3,600 to 5,500 feet. The average annual precipitation is about 40 to 60 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

This unit is 45 percent Woodseye very gravelly loam and 30 percent Jayar very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Althouse soils in the more gently sloping areas, 10 percent soils that are similar to the Woodseye soil but are less than 35 percent rock fragments, and 5 percent Rock outcrop. The percentage of included components varies from one area to another.

The Woodseye soil is shallow and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface is covered with a mat of decomposed leaves, needles, and twigs about 1/2 inch thick. The surface layer is very dark grayish brown very gravelly loam about 4 inches thick. The subsoil, to a depth of 15 inches, is dark brown very gravelly loam. Hard metavolcanic bedrock is at a depth of 15 inches. Depth to hard bedrock ranges from 10 to 20 inches.

Permeability of the Woodseye soil is moderate. Available water capacity is about 0.5 inch to 2 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is high.

The Jayar soil is moderately deep and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface is covered with a mat of leaves and needles about 1 inch thick. The surface layer is dark yellowish brown very gravelly loam about 3 inches thick. The upper 11 inches of the subsoil is dark brown very gravelly loam. The lower 17 inches is dark brown extremely gravelly loam. Metavolcanic bedrock is at a depth of 31 inches. Depth to hard bedrock ranges from 20 to 40 inches.

Permeability of this Jayar soil is moderate. Available water capacity is about 1.5 to 5 inches. Water supplying capacity is 9 to 12 inches. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high.

This unit is used for timber production, watershed, wildlife habitat, and recreation.

Woodland.—The Woodseye soil is poorly suited to the production of Douglas-fir, white fir, and Shasta red fir. Based on a site index of 80 for Douglas-fir, the potential production per acre is 4,060 cubic feet from an even-aged, fully stocked stand of trees 70 years old or 32,010 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 110 years old.

The Jayar soil is well suited to the production of Douglas-fir, white fir, and Shasta red fir. Based on a site index of 118 for Douglas-fir, the potential production per acre is 6,660 cubic feet from an even-aged, fully stocked stand of trees 60 years old or 61,290 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

The main concerns in producing and harvesting timber are the hazard of erosion, steepness of slope, and difficulty of reforestation. Steepness of slope limits the kinds of equipment that can be used on this unit. High-lead logging and other cable logging systems that partially or fully suspend logs damage the soil surface less and generally are less costly than some of the more conventional methods of harvesting timber. Harvesting timber and building roads using methods that cause excessive disturbance to the soils increase the loss of soil material, thus leaving a greater number of rock fragments on the surface.

Minimizing the risk of erosion is essential in forest management. Proper design of road drainage systems and care in the placement of culverts help to control erosion.

Material cast to the side when building roads can damage vegetation and is a potential source of sedimentation. Excessive damage to the soil surface and to the vegetation downslope of roadbuilding sites can be avoided by hauling away waste material.

Cut slopes generally are stable, but minor failures can occur where the bedrock is highly fractured or where rock layers are parallel to the slope. Some slumping of the soils onto the roadway may occur. Road cuts and fills need to be seeded to permanent vegetation. Grass straw mulch helps to stabilize cuts.

Reforestation must be carefully managed. Tree seedlings have a low rate of survival because of droughtiness and frost heaving. Drought can occur either in summer or in winter. Droughtiness caused by coarse fragments in the soil decreases seedling survival. Mulching around seedlings helps to retain moisture in summer. Because small stones make planting difficult, hand planting of nursery stock is usually necessary to establish or improve a stand. Trees are subject to windthrow because of limited rooting depth.

Tree seedlings may not be able to replace the moisture they lose through transpiration when the soil is frozen. Freezing and thawing can push seedlings out of the ground, which results in damage to the roots. Severe frosts can damage or kill seedlings.

If site preparation is not adequate, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees.

Recreation.—If this unit is used for recreational development, the main limitation is steepness of slope. This limits the use of areas of this unit mainly to a few

paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs.

87F—Woodseye-Rock outcrop complex, 20 to 60 percent slopes. This map unit is on mountainsides and ridges. Elevation is 3,600 to 5,500 feet. The average annual precipitation is about 40 to 60 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days.

This unit is 65 percent Woodseye very gravelly loam and 20 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Jayar soils and 5 percent soils that are less than 35 percent rock fragments. The percentage of included soils varies from one area to another.

The Woodseye soil is shallow and well drained. It formed in colluvium derived dominantly from altered sedimentary and extrusive igneous rock. Typically, the surface is covered with a mat of partially decomposed leaves and needles about 2 inches thick. The surface layer is very dark brown very gravelly loam about 8 inches thick. The upper part of the subsoil is dark brown very cobbly loam about 3 inches thick. The lower part, to a depth of 18 inches, is dark brown extremely stony loam. Hard metavolcanic bedrock is at a depth of 18 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Woodseye soil is moderate. Available water capacity is about 0.5 inch to 2 inches. Water supplying capacity is 10 to 13 inches. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is high.

Rock outcrop consists of areas of exposed bedrock. Runoff from these areas is very rapid.

This unit is used for wildlife habitat, recreation, and livestock grazing.

Livestock grazing.—The present vegetation in most areas is mainly scattered Douglas-fir and white fir, greenleaf manzanita, snowbrush ceanothus, and beargrass. The production of vegetation is limited by droughtiness.

If this unit is overgrazed, the proportion of preferred forage plants decreases and the proportion of less preferred forage plants increases. Therefore, livestock grazing should be managed so that the desired balance of species is maintained in the plant community.

Livestock grazing should also be managed to protect the soil in this unit from excessive erosion. Slope limits access by livestock and promotes overgrazing of the less sloping areas. Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce vegetation suitable for grazing. Management practices suitable for use on this unit are proper range use, deferred grazing, and rotation grazing. Use of mechanical treatment practices is not practical, because the surface is very gravelly and the slopes are steep.

Recreation.—If this unit is used for recreational development, the main limitations are steepness of slope, areas of Rock outcrop, and small stones. Steepness of slope limits the use of areas of this unit mainly to a few paths and trails, which should extend across the slope. Coarse fragments in the surface layer also limit this unit for some recreational uses. Erosion and sedimentation can be controlled and the beauty of the area enhanced by maintaining adequate plant cover.

This map unit is in capability subclass VIIs, nonirrigated.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

Edward E. Weber, district conservationist, Soil Conservation Service, assisted in writing this section.

Approximately 5 percent, or 58,180 acres, of all the land in Josephine County is used for farms and ranches. This includes about 17,800 acres of woodland pasture and small areas of woodland. Of the total, 30,000 acres is used for irrigated pasture, 7,350 acres for hay, 1,150 acres for silage and green chop, 740 acres for mint, 300 acres for hops, 450 acres for small grain, and 390 acres for tree fruits, nuts, berries, grapes, vegetables, and other specialty crops (*7*).

The cropland is in the river valleys that are irregularly scattered throughout the county. The cropland is mainly in the Rogue River Valley, near Grants Pass; the Applegate River Valley, south of the Rogue River Valley; and the Illinois River Valley, in the south-central part of the county. Numerous other small valleys in the area are also used as cropland.

Several areas of Abegg, Kerby, Manita, Pollard, and Ruch soils and a few small areas of Camas and Newberg soils are forest land that can be converted to cropland. In some areas, however, irrigation water may not be available.

The soils in this county have many characteristics that affect their behavior and the management practices needed for various uses. An awareness of these characteristics and application of the best management practices for each soil will improve or help to sustain productivity.

The hazard of erosion is a matter of great concern on most of the more sloping soils in the county, especially on those soils that formed in granitic material. Among the practices that can be used to control erosion are soil management; plant management; crop residue use; management and treatment of critical areas such as pond embankments, dikes, road cuts and fills, and stream corridors; and irrigation water and drainage management. Minimum tillage can also help to control erosion. The kind and amount of plant cover and crop residue govern its effectiveness in controlling erosion. Proper management of irrigation water and drainage limits runoff and promotes plant growth. For each kind of soil and crop, specific practices need to be applied to keep the soil losses at an acceptable level. Of the soils presently used for crops and pasture, the Holland, Clawson, Barron, Manita, Pollard, and Ruch soils are most susceptible to erosion.

Using machinery and grazing livestock when the soils are wet results in compaction of the soils. Soil compaction reduces permeability and the rate of infiltration causing an increase in water erosion. Root development also is restricted, causing a decrease in productivity. Proper management practices can prevent compaction and help to reclaim compacted areas.

Drainage is a concern on the fine textured and coarse textured soils. A high water table can restrict the choice of crops and use of the best management practices.

Soils in this area that have a high water table are the Banning, Brockman, Clawson, Copsey, Cove, Jerome, Jumpoff, Selmac, and Wapato soils.

Poor drainage exists primarily because of the topography and internal characteristics of the soils; however, use of inefficient irrigation systems can increase the amount of excess water in the soil. The contours of the natural landscape direct the flow of water and allow the water to concentrate in some areas and saturate the soils for varying lengths of time. Unless the soils are artificially drained, the root zone can become waterlogged for long periods so that the crop roots cannot get enough oxygen. The Brockman, Copsey, Cove, Jerome, and Selmac soils have a claypan or some other impervious layer that restricts the movement of water, resulting in a high water table and limited rooting depth. Drainage can be improved in most soils by use of surface or subsurface drainage systems.

Irrigation is needed for high crop yields because of the lack of adequate rainfall during the growing season. Before irrigating, factors such as the available water capacity and water intake rate of the soil, crop needs, and availability of water should be considered. Sprinkler, furrow, border, wild flooding, and drip irrigation systems generally are used in the survey area. The choice of a system depends mainly on the soil characteristics, the cropping system used, and the crops grown. Sprinkler irrigation is suited to soils that have different slopes and water intake rates and that are used for different crops, because the water is applied more evenly and precisely. It is also used in spring to control frost and to delay blooming of fruit trees and grapes. Few soils are suited to flood irrigation using borders and furrows because the soils need to be nearly level and have uniform slopes. Drip irrigation is used mainly for vine and tree crops.

Applying practices designed for specific crops and soils is essential for sustained high yields. Management practices needed to achieve high yields and high-quality crops vary depending on the kind of soil and crop; however, fertilizer or manure is needed to increase the fertility of all the soils in the area. Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, and boron all enhance plant growth, but each element reacts differently when added to the soils. A specific fertilizer program is needed for each soil, therefore, to achieve management goals and to prevent excessive losses of fertilizer.

The use of organic material, such as animal manure, green manure, plant residue, and compost, is beneficial for maintaining and improving soil productivity. Adding organic matter to coarse-textured soils helps to retain moisture and plant nutrients in the soils, and adding organic matter to fine-textured soils improves workability, infiltration, aeration, and structure of the soils.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, sulfur, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use (none in Josephine County).

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Terry A. Johnson, forester, Soil Conservation Service, assisted in writing this section.

About 70 percent of Josephine County is commercial forest land. Forest fires and use of a variety of timber harvesting methods and management practices have affected the natural vegetation of the forests. Tree species below an elevation of 4,000 feet are mainly Douglas-fir, ponderosa pine, sugar pine, and incense-cedar, the percentage of each varying from stand to stand. Species such as Pacific madrone, tanoak, canyon live oak, and California black oak also are common. The percentage of Douglas-fir is less and of ponderosa pine is greater in areas that receive less than 35 inches of rainfall annually.

White fir, Shasta red fir, Port-Orford-cedar, and Douglas-fir are the most extensive tree species between elevations of 4,000 and 5,500 feet. Lesser amounts of incense-cedar, sugar pine, and ponderosa pine are also in these areas. Above this elevation the forest is composed of varying amounts of Shasta red fir, white fir, and mountain hemlock.

Douglas-fir and ponderosa pine are used for lumber, plywood, poles, and piling. Mountain hemlock and true firs are used for lumber and pulp. Incense-cedar is used for lumber and pencil stock, and Port-Orford-cedar is used for lumber. Wood for fuel is the most common use of Pacific madrone and California black oak.

The most productive soils for Douglas-fir are those that formed in material derived from metamorphosed sedimentary and volcanic rock, particularly the Pollard, Josephine, Colestine, and Speaker soils. The least productive soils are those that formed in material derived from ultramafic rock, such as peridotite and serpentinite. Examples of these soils are Eightlar and Dubakella.

Jeffrey pine and incense-cedar are the dominant tree species on soils that formed in material derived from ultramafic rock. In addition, other soils that are shallow and have a high percentage of rock fragments, such as the Vermisa and Woodseye soils, produce sparse stands of Douglas-fir.

Soils on north-facing slopes produce more timber than the same soils on south-facing slopes because evaporation and transpiration are much greater on the south-facing slopes than on the north-facing slopes. Timber production is low in areas that have a cryic soil temperature, primarily because the growing season is short. Available moisture commonly is a limitation late in summer and early in fall in these areas.

Table 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x*, indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 6, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* (fig. 12). This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. The interpretative data for Douglas-fir contained in the map unit descriptions were based on USDA Technical Bulletin 201 (*4*). Cubic feet volumes were interpreted from table 2 in this bulletin, and board feet volumes were calculated from table 3. The interpretive data for ponderosa pine were based on tables 6 and 11 in USDA Technical Bulletin 630 (*6*).

Trees to plant are those that are suited to the soils and to commercial wood production.

woodland understory vegetation

Lawrence P. Lilley, range conservationist, Soil Conservation Service, assisted in writing this section.

The mountainous terrain in Josephine County has escaped decimation of its vegetation by flooding, volcanic activity, and glaciation, which have altered surrounding landscapes in relatively recent times. This has permitted the development of a plant community that is rich in endemic and relic plant species (*15*).

Southwestern Oregon is a converging point of several major regional environmental gradients, resulting in a rare mix of plant species from adjoining regions. The species that grow together in this area include those that otherwise grow both far to the north, such as western hemlock and noble fir, and those to the south, such as Jeffrey pine, Shasta red fir, and tanoak. Likewise, some species that normally grow east of the Cascades are mingled with westside species. Examples are Idaho fescue intermingled with California fescue and ponderosa pine intermingled with Pacific madrone.

The diversity of plant communities is closely related to the many types of growing conditions in this area. The area is geologically complex, and parent materials have

Tree species	Site class				
	1	2	3	4	5
	Site index range				
Douglas-fir	186+	185-156	155-126	125-96	≤95
Ponderosa pine	113+	112-99	98-85	84-71	70-57
Shasta red fir	56+	55-46	45-36	35-26	≤25

Figure 12.—Relationship between the site class and site index for selected species of trees measured in the survey area.

weathered into many kinds of soil, which strongly influences the growth and distribution of plants. An example is the serpentinitic soils and their associated plants.

The average annual precipitation in this area ranges from about 30 inches to more than 80 inches. A major change in plant distribution is associated with the precipitation break at about 35 to 40 inches. Elevation in this area ranges from 750 feet to more than 7,000 feet. This creates a wide variation in the length of the growing season and greatly influences the distribution of vegetation. Aspect differences are also major factors influencing plant distribution. The temperature and moisture differences on north- and south-facing slopes produce distinctly different growing conditions that result in different plant communities.

The kind of woodland understory vegetation and its density depend on a number of factors, including the density of the forest canopy, current land use, the kinds of soil, exposure, and previous land treatment. Understory plant communities change after timber is harvested, generally increasing in kinds and amounts of plants. These plants generally can be managed to increase their production, conserve water, and control soil erosion.

Many kinds of wildlife use the understory vegetation for food and cover. Grazing of understory vegetation by cattle is also an important use of the forested areas extending from the Applegate River south into the Siskiyou Mountains, as well as those areas near the Illinois River west of Cave Junction.

Rangeland in Josephine County amounts to approximately 81,600 acres, or 7 percent, of the county, and it is included in the discussion of woodland understory vegetation (*13*). In addition, management considerations are discussed in the appropriate map unit descriptions in the section "Detailed soil map units."

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some types of forest land, under proper management, can produce enough understory vegetation to support grazing of livestock or wildlife, or both. The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees, the density of the canopy, and the depth and condition of the forest litter. The density of the canopy determines the amount of light that understory plants receive during the growing season, and it relates to competition for water among plants comprising the community.

Table 7 shows, for each soil suitable for woodland use, the potential for producing understory vegetation. The understory includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4 1/2 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, soil moisture is above average during the optimum part of the growing season; in a normal year, soil moisture is average; and in an unfavorable year, it is below average.

Table 7 also shows the common names of the characteristic vegetation that grows on a specified soil and the percentage composition, by air-dry weight, of each kind of plant. The kind and percentage of understory plants listed in the table are those to be expected in areas where the density of the canopy is most nearly typical of that of forests that yield the highest production of wood crops.

recreation

Recreation is important to the economy of Josephine County. The natural resources of the county, of which soils are an important part, are used for nearly all of the recreational activities. Demand for the use of these resources is constantly increasing.

The Rogue, Illinois, and Applegate Rivers are used for many recreational activities. Floating and jet boating are becoming more popular on the "white water" of these rivers (fig. 13). Water-skiing is also popular on the Rogue River above Savage Rapids Dam. Many deep, beautiful swimming holes are in the rivers and several of the tributaries. The rivers are world famous for excellent salmon and steelhead fishing, as well as for trout fishing. Trout and warmwater fish can be caught in Lake Selmac throughout the year.

Hiking along the Rogue River trail, downstream from Graves Creek, is interesting and scenic. Other trails, primarily on national forest lands, offer opportunities to visit beautiful and unique areas of the county. Camping on both public and private campgrounds is enjoyed by many people. A variety of wildlife species are in the area for observing, photographing, and hunting. Among the game animals and birds are deer, black bear, silver-gray squirrel, grouse, band-tailed pigeon, doves, California quail, mountain quail, and ducks.

Many scenic and educational areas are easily accessible. The Oregon Caves National Monument, a network of caverns that formed in marble, is in the county. Thousands of people visit it each year. Roads provide easy access to many areas of the Rogue and Illinois Rivers. The steep, vertical rock walls that rise above the Rogue River at Hellgate Canyon and the Illinois River Falls west of Selma provide esthetic value. Salmon and steelhead can be observed at the fish ladder at Savage Rapids Dam on the Rogue River. Gladiolus fields, hop yards, and mint fields can all be seen from paved roads. The last covered bridge in Josephine County can be viewed in Sunny Valley.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water



Figure 13.—Floating on the "white water" of the Rogue River near Hellgate Canyon.

impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding

during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

wildlife habitat

Robert A. Corthell, biologist, Soil Conservation Service, assisted in writing this section.

The kinds and number of most wildlife species in the survey area are related to the kinds of soil in the area. This relationship is indirect and is influenced primarily by the kinds of plant communities present, topography, and land use. Natural plant communities consist of a variety of vegetation, most of which is valuable to wildlife.

Wildlife habitat varies greatly throughout the survey area. There are basically four landscape zones that relate to the abundance and management of wildlife species in the county. These zones correspond to the map units in the section "General soil map units."

Flood plain zone.—This zone consists of general soil map unit 1. It includes riparian areas along perennial streams and provides some of the most productive areas for wildlife. Fish and animals such as beaver, mink, and otter live in the water in these areas, and other kinds of animals use the areas for food, cover, and water. These areas also serve as travelways for many kinds of wildlife. Cultivated crops provide food and cover, as does the vegetation along fences and irrigation ditches.

Stream terrace and alluvial fan zone.—This zone consists of general soil map units 2, 3, 4, and 5. Many areas in this zone are used for cultivated crops. These crops and the vegetation along fences and irrigation ditches provide food and cover for wildlife. Rural development is common in this zone.

Hillside zone.—This zone consists of general soil map unit 6. A few cultivated areas in this zone provide food and cover for wildlife, as does vegetation along fences and irrigation ditches. The plant communities in forested areas provide additional wildlife habitat.

Mountain slope zone.—This zone consists of general soil map units 7 through 14. This zone is used for timber and as rangeland. There are many different plant communities in this zone, and all have different value as wildlife habitat. The plant communities in units 13 and 14 are important for seasonal use by some species. Most animals, other than those that hibernate in winter, migrate from these areas.

Wildlife common in Josephine County include black-tailed deer, black bear, mountain lion, bobcat, coyote, mink, otter, beaver, skunk, raccoon, weasel, rabbit, several kinds of squirrel, wood rats, mountain beaver, mice, moles, and gophers. A large number of resident or migrant bird species are in the county, including hawks, owls, quail, band-tailed pigeon, dove, crow, jays, and many kinds of woodpeckers, flycatchers, shore birds, and songbirds. Several kinds of snakes, lizards, and salamanders are also common.

The Rogue River and its tributaries are used extensively by anadromous fish such as coho salmon, chinook salmon, and steelhead trout. The number of anadromous fish in the Rogue River and its tributaries ranks second only to that in the Columbia River in Oregon. Among the fish in the county are rainbow trout, cutthroat trout, warmwater game fish, and several kinds of nongame fish. Some soils in the area are suitable for construction of small fish ponds.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are Idaho fescue, Lemmon needlegrass, and mountain brome.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are cottonwood, Pacific madrone, white oak, black oak, dogwood, blackberry, and ash.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are ponderosa pine, sugar pine, Douglas-fir, incense-cedar, and white fir.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are wedgeleaf ceanothus, deerbrush ceanothus, snowberry, whiteleaf manzanita, and Pacific rhododendron.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include mountain quail, California quail, pheasant, meadowlark, crows, cottontail, and coyote.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include blue grouse, ruffed grouse, band-tailed pigeon, woodpeckers, silver-gray squirrel, raccoon, black-tailed deer, and black bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the

surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil

through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil

after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a

depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent.

Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

In table 15, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

physical and chemical analyses of selected soils

The results of physical analysis of several typical pedons in the survey area are given in table 17 and the results of chemical analysis in table 18. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil series and their morphology." Soil samples were analyzed by the Oregon Soil Characterization Laboratory, Oregon State University, Corvallis, Oregon, and the Soil Survey Laboratory, Soil Conservation Service, Riverside, California.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (*11*).

Sand—(0.05-2.0 mm fraction) weight percentages of materials less than 2 mm (3A1).
Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all materials less than 2 mm (3A1).
Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of materials less than 2 mm (3A1).
Water retained—pressure extraction, percentage of oven-dry weight of less than 2 mm material; 1/3 bar (4B1), 15 bars (4B2).
Moist bulk density—of less than 2 mm material, saran-coated clods (4A1).
Organic carbon—dichromate, ferric sulfate titration (6A1a).
Extractable cation—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (6O2), sodium (6P2), potassium (6Q2).
Extractable acidity—barium chloride-triethanolamine II (6H2a).
Cation-exchange capacity—sum of cations (5A3a).
Cation-exchange capacity—ammonium acetate, pH 7.0 (5A6a).
Base saturation—ammonium acetate, pH 7.0 (5C1).
Iron—dithionate-citrate extract (6C2b).
Available phosphorus—(method of reporting laboratory).

engineering index test data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites and are described in the section "Soil series and their morphology." The soil samples were tested by West Technical Service Center, Engineering and Watershed Planning Soil Mechanics Laboratory, Soil Conservation Service, Portland, Oregon.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*12*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 20, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Inceptisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ochrept (*Och*, meaning pale, plus *rept*, from Inceptisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Xerochrepts (*Xerl*, meaning dry, plus *ochrept*, the suborder of the Inceptisols that have a xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Xerochrepts.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is coarse-loamy, mixed, mesic Typic Xerochrepts.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series. An example is the Barron series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*10*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*12*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Abegg series

The Abegg series consists of deep, well drained soils on high stream terraces. These soils formed in alluvium and colluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 2 to 20 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is 52 degrees F.

Typical pedon of Abegg gravelly loam, 2 to 7 percent slopes, in a forested area, about one-half mile south of Kerby and 150 feet west of the highway; approximately 1,620 feet west and 1,400 feet north of the southeast corner of sec. 9, T. 39 S., R. 8 W.

O1—1.5 inches to 0; duff layer of leaves, needles, and twigs.
A11—0 to 4 inches; very dark grayish brown (10YR 3/2) gravelly loam, dark brown (10YR 3/3) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots and few coarse roots; many fine interstitial pores; 30 percent pebbles; medium acid; clear smooth boundary.
A12—4 to 9 inches; dark brown (7.5YR 3/2) gravelly loam, dark brown (10YR 4/3) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots and few coarse roots; many fine interstitial pores; 35 percent pebbles; medium acid; clear smooth boundary.
B1—9 to 16 inches; dark brown (7.5YR 3/4) gravelly loam, dark yellowish brown (10YR 4/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots and few coarse roots; common very fine tubular pores; 30 percent pebbles; strongly acid; clear smooth boundary.
B21t—16 to 27 inches; dark brown (7.5YR 3/4) very gravelly clay loam, strong brown (7.5YR 4/6) dry; weak medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few medium and coarse roots; common very fine tubular pores; few thin reddish brown (5YR 4/4) clay films; 40 percent pebbles; strongly acid; clear smooth boundary.
B22t—27 to 38 inches; dark reddish brown (5YR 3/4) extremely gravelly clay loam, strong brown (7.5YR 4/6) crushed, yellowish brown (10YR 5/4) dry; weak medium subangular blocky structure; hard, friable, sticky and slightly plastic; few medium and coarse roots; common very fine tubular pores; few moderately thick reddish brown (5YR 4/4) clay films; 65 percent pebbles; strongly acid; clear smooth boundary.
B3—38 to 56 inches; dark brown (7.5YR 3/4) extremely gravelly loam, yellowish brown (10YR 5/6) dry; weak medium subangular blocky structure parting to moderate fine subangular blocky; hard, friable, sticky and slightly plastic; few medium and coarse roots; common very fine tubular pores; few thin reddish brown (5YR 4/4) clay films; 70 percent pebbles; strongly acid; clear wavy boundary.
C—56 to 60 inches; variegated brown (7.5YR 4/4) and reddish brown (5YR 4/4) extremely gravelly loamy sand, yellowish brown (10YR 5/6) dry; massive; slightly hard, very friable; 65 percent pebbles and 10 percent cobbles; strongly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 6 when dry, and chroma of 2 to 4 when moist or dry. It averages 15 to 35 percent pebbles and 0 to 10 percent cobbles.

The B2t horizon has hue of 10YR, 7.5YR, or 5YR. It has value of 3 to 5 when moist and 4 to 6 when moist or dry. The B2t horizon is clay loam, and it is 25 to 35 percent clay. It averages 40 to 70 percent rock fragments, of which 0 to 20 percent is cobbles.

The C horizon and the layer below a depth of 40 inches are loamy sand or sandy loam. They average 45 to 80 percent rock fragments, of which 10 to 20 percent is cobbles.

Althouse series

The Althouse series consists of deep, well drained soils on steep mountainsides. These soils formed in colluvium and residuum derived from altered igneous and sedimentary rock. Slopes are 35 to 75 percent. The mean annual precipitation is about 60 inches, and the mean annual air temperature is 43 degrees F.

Typical pedon of Althouse very gravelly silt loam, 35 to 75 percent north slopes, in a forested area, about 1 mile southwest of the Oregon Caves National Monument; approximately 1,360 feet east and 2,080 feet south of the northwest corner of sec. 16, T. 40 S., R. 6 W.

O1—1 inch to 0; partially decomposed needles and twigs.
A1—0 to 3 inches; very dark grayish brown (10YR 3/2) very gravelly silt loam, very dark brown (10YR 2/2) crushed, dark brown (10YR 4/3) dry; weak very fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine pores; 35 percent pebbles and 5 percent cobbles; medium acid; clear wavy boundary.
B1—3 to 9 inches; dark brown (7.5YR 4/4) extremely gravelly silt loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots, common medium and coarse roots; many very fine pores; 60 percent pebbles and 5 percent cobbles; slightly acid; clear wavy boundary.
B21—9 to 18 inches; dark yellowish brown (10YR 4/4) extremely gravelly silt loam, yellowish brown (10YR 5/4) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; many very fine and fine interstitial pores and common very fine and fine tubular pores; 65 percent pebbles and 5 percent cobbles; slightly acid; gradual wavy boundary.
B22—18 to 31 inches; yellowish brown (10YR 5/4) very gravelly silt loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine and fine interstitial pores and common very fine and fine tubular pores; 55 percent pebbles and 5 percent cobbles; slightly acid; gradual wavy boundary.
C1—31 to 46 inches; light yellowish brown (2.5Y 6/4) extremely gravelly silt loam, light yellowish brown

(10YR 6/4) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many pores; 65 percent pebbles and 15 percent cobbles; slightly acid; clear wavy boundary.

C2r—46 inches; partially weathered metavolcanic bedrock.

Depth to weathered bedrock is 40 to 60 inches. The control section averages 10 to 18 percent clay and 50 to 85 percent rock fragments, of which 0 to 20 percent is cobbles and stones.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when dry. It averages 35 to 50 percent rock fragments, of which 0 to 10 percent is cobbles and stones.

The B horizon has hue of 7.5YR or 10YR, value of 3 to 5 when moist and 5 or 6 when dry, and chroma of 3 or 4 when moist. It is loam or silt loam, and it is more than 50 percent rock fragments.

The C horizon has hue of 2.5Y or 10YR and chroma of 3 or 4 when moist or dry. It is loam or silt loam. The horizon averages 60 to 85 percent rock fragments, of which 0 to 20 percent is cobbles and stones.

Banning series

The Banning series consists of deep, somewhat poorly drained soils on alluvial fans and in drainageways. The soils formed in alluvium weathered from metamorphic, granitic, and ultramafic rock. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual temperature is about 52 degrees F.

Typical pedon of Banning loam in a cultivated area, about 1 mile north of Provolt; approximately 1,100 feet north and 100 feet west of the southeast corner of sec. 36, T. 37 S., R. 5 W.

Ap—0 to 6 inches; black (10YR 2/1) loam, dark grayish brown (10YR 4/2) dry; few brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine tubular pores; few fine concretions; slightly acid; abrupt smooth boundary.

A3—6 to 14 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; common fine brown (7.5YR 4/4) mottles; moderate coarse prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and plastic; common very fine and fine roots; many fine and medium tubular pores; common fine concretions; slightly acid; clear smooth boundary.

B21t—14 to 27 inches; very dark grayish brown (10YR 3/2) clay loam, brown (10YR 5/3) dry; few fine brown (7.5YR 4/4) mottles; moderate coarse prismatic structure parting to weak medium subangular blocky; very hard, firm, sticky and plastic; common very fine and fine roots; many fine and medium tubular pores; common moderately thick clay films on peds; few fine concretions; 10 percent pebbles; neutral; clear wavy boundary.

B22t—27 to 50 inches; very dark grayish brown (10YR 3/2) clay loam, dark grayish brown (10YR 4/2) dry; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; many fine and medium tubular pores; common moderately thick clay films on peds; 10 percent pebbles; neutral; clear wavy boundary.

C—50 to 60 inches; dark grayish brown (10YR 4/2) clay loam, grayish brown (10YR 5/2) dry; massive; hard, firm, sticky and plastic; many fine and medium tubular pores; few moderately thick clay films in pores; 10 percent pebbles; neutral.

Depth to weathered bedrock is 60 inches or more. The particle-size control section averages 5 to 25 percent pebbles and 27 to 35 percent clay.

The A horizon has value of 2 or 3 when moist and chroma of 1 or 2 when moist. It averages 20 to 27 percent clay and 0 to 15 percent pebbles.

The Bt horizon has hue of 7.5YR or 10YR, value of 2 to 4 when moist and 4 or 5 when dry, and chroma of 1 to 3 when moist and 2 or 3 when dry. It is clay loam or gravelly clay loam.

The C horizon has value of 3 or 4 when moist and chroma of 1 to 3 when moist or dry. It is stratified with coarser textured material in some pedons.

Barron series

The Barron series consists of deep, somewhat excessively drained soils on toe slopes and alluvial fans. These soils formed in alluvium and colluvium weathered from granitic rock. Slopes are 2 to 12 percent. The mean annual precipitation is 35 inches, and the mean annual air temperature is 53 degrees F.

Typical pedon of Barron coarse sandy loam, 2 to 7 percent slopes, in a subdivided area, about 4 miles northwest of Grants Pass, near the junction of Vannoy Creek Road and Azalea Drive; approximately 2,000 feet north and 260 feet west of the southeast corner of sec. 4, T. 36 S., R. 6 W.

A11—0 to 4 inches; dark grayish brown (10YR 4/2) coarse sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; common roots; medium acid; clear smooth boundary.

A12—4 to 9 inches; dark grayish brown (2.5Y 4/3) coarse sandy loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common roots; medium acid; clear gradual boundary.

B2—9 to 35 inches; light olive brown (2.5Y 5/4) coarse sandy loam, very pale brown (10YR 7/3) dry; weak

fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few roots; medium acid; clear gradual boundary.

C—35 to 60 inches; light olive brown (2.5Y 5/4) coarse sandy loam, very pale brown (10YR 7/4) dry; massive; slightly hard, very friable, nonsticky and nonplastic; few roots; medium acid.

Depth to bedrock is 60 inches or more. The control section averages 8 to 18 percent clay.

The A horizon has hue of 2.5Y or 10YR and value of 5 to 7 when dry.

The B horizon has hue of 2.5Y or 10YR, value of 6 or 7 when dry, and chroma of 4 to 6 when moist and 3 to 5 when dry. It is coarse sandy loam or sandy loam.

The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 when dry, and chroma of 2 to 6 when moist or dry. It is coarse sandy loam or sandy loam.

Beekman series

The Beekman series consists of moderately deep, well drained soils on mountainsides. These soils formed in colluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 50 to 100 percent. The mean annual precipitation is 45 inches, and the mean annual air temperature is 49 degrees F.

Typical pedon of Beekman gravelly loam, in a forested area of Beekman-Colestine complex, 50 to 80 percent north slopes, about 3 miles southeast of Placer along McCoy Creek Road; approximately 1,540 feet south and 80 feet east of the northwest corner of sec. 14, T. 34 S., R. 5 W.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 4/3) dry; weak fine granular structure; soft, friable, nonsticky and slightly plastic; many very fine and fine roots and few medium roots; many interstitial pores; 30 percent angular pebbles; slightly acid; clear smooth boundary.

A3—5 to 14 inches; dark yellowish brown (10YR 3/4) very gravelly loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many interstitial pores; 60 percent angular pebbles; medium acid; gradual smooth boundary.

B2—14 to 25 inches; brown (10YR 4/3) very gravelly loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; many very fine tubular pores; 55 percent angular pebbles; slightly acid; clear irregular boundary.

R—25 inches; fractured metamorphic bedrock; fractures are 4 to 8 inches apart; voids and fractures are not all filled.

Depth to highly fractured bedrock is 20 to 40 inches.

The A horizon has value of 4 to 6 when dry, and it has chroma of 2 to 4 when moist and 3 or 4 when dry.

The B horizon has hue of 2.5Y, 10YR, or 7.5YR. It has value of 4 or 5 when moist and 5 to 7 when dry, and it has chroma of 3 or 4 when moist or dry. The horizon is loam or clay loam. It is 18 to 30 percent clay, and it averages 35 to 75 percent rock fragments.

Bigelow series

The Bigelow series consists of deep, well drained soils on mountainsides and in glacial basins. These soils formed in colluvium weathered from granitic rock, and they are underlain by glacial till. Slopes are 5 to 65 percent. The mean annual precipitation is 65 inches, and the mean annual air temperature is 41 degrees F.

Typical pedon of Bigelow very gravelly sandy loam, 35 to 65 percent slopes, in a forested area, about 1 mile east of the Oregon Caves National Monument; approximately 2,360 feet west and 200 feet north of the southeast corner of sec. 11, T. 40 S., R. 6 W.

O1—1 inch to 0; undecomposed needles and twigs.

A11—0 to 5 inches; very dark brown (10YR 2/2) very gravelly sandy loam, black (10YR 2/1) crushed, very dark grayish brown (10YR 3/2) dry; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium and coarse roots; many very fine pores; 50 percent pebbles; medium acid; clear smooth boundary.

A12—5 to 14 inches; very dark brown (10YR 2/2) very gravelly sandy loam, dark grayish brown (10YR 4/2) dry; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and common fine to coarse roots; many very fine pores; 35 percent pebbles; medium acid; clear wavy boundary.

A13—14 to 26 inches, very dark grayish brown (10YR 3/2) very cobbly sandy loam, dark grayish brown (10YR 4/2) dry; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and common fine to coarse roots; many very fine pores; 30 percent pebbles and 15 percent cobbles; medium acid; clear wavy boundary.

C1—26 to 50 inches; dark brown (10YR 3/3) extremely stony sandy loam, dark brown (10YR 4/3) dry; massive; soft, very friable, nonsticky and nonplastic; common medium and coarse roots; many very fine pores; 15 percent pebbles, 20 percent cobbles, and 30 percent stones; medium acid; diffuse wavy boundary.

C2—50 to 65 inches; dark brown (10YR 3/3) extremely stony sandy loam, brown (10YR 5/3) dry; massive; soft, very friable, nonsticky and nonplastic; common medium and coarse roots; many pores; 15 percent

pebbles, 20 percent cobbles, and 30 percent stones; strongly acid; gradual wavy boundary.
C3—65 to 67 inches; glacial till; massive; very hard, very firm.

Depth to bedrock is 60 inches or more. The control section averages 40 to 75 percent rock fragments, of which 15 to 50 percent is cobbles and stones.

The A horizon has value of 2 or 3 when moist and 3 to 5 when dry. It has chroma of 1 to 3 when moist and 2 or 3 when dry. The horizon averages 35 to 65 percent rock fragments, of which 0 to 15 percent is cobbles and stones.

The C horizon has value of 2 to 5 when moist and 4 to 6 when dry, and it has chroma of 2 to 4 when dry. The horizon averages 45 to 80 percent rock fragments, of which 35 to 55 percent is cobbles and stones. Very firm glacial till commonly is below a depth of 60 inches, but it is at a depth of 40 inches in some pedons.

Brockman series

The Brockman series consists of deep, moderately well drained soils on alluvial fans. These soils formed in clayey alluvium weathered from serpentinite and peridotite. Slopes are 2 to 20 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Brockman cobbly clay loam, 7 to 20 percent slopes, in a forested area, about 5 miles east of Merlin; approximately 620 feet east and 35 feet north of the southwest corner of sec. 20, T. 35 S., R. 5 W.

A1—0 to 4 inches; dark reddish brown (5YR 3/2) cobbly clay loam, reddish brown (5YR 4/3) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; many very fine to coarse roots; many very fine interstitial pores; 15 percent hard cobbles and 15 percent hard pebbles; slightly acid; clear smooth boundary.
A3—4 to 9 inches; dark reddish brown (5YR 3/3) cobbly clay loam, reddish brown (5YR 4/3) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; many very fine to coarse roots; many very fine tubular pores; 15 percent cobbles and 10 percent pebbles; slightly acid; abrupt wavy boundary.
B2—9 to 16 inches; dark reddish brown (5YR 3/4) cobbly clay, reddish brown (5YR 4/4) dry; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; many very fine to coarse roots; common fine tubular pores; 10 percent cobbles and 10 percent pebbles; slightly acid; abrupt wavy boundary.
IIC1—16 to 34 inches; reddish brown (5YR 4/4) cobbly clay, yellowish red (5YR 4/6) dry; massive; extremely hard, extremely firm, very sticky and very plastic; common intersecting slickensides; few very fine to coarse roots; few very fine tubular pores; 15 percent cobbles and 10 percent pebbles; slightly acid; clear wavy boundary.
IIIC2—34 to 60 inches; dark brown (7.5YR 3/4) cobbly clay, brown (7.5YR 4/4) dry; massive; extremely hard, extremely firm, very sticky and very plastic; 15 percent partially weathered cobbles and 10 percent partially weathered pebbles; neutral.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 5YR or 7.5YR, value of 2 or 3 when moist and 3 to 5 when dry, and chroma of 2 to 4 when moist and 3 or 4 when dry. It averages 0 to 20 percent pebbles and 0 to 30 percent cobbles. Rock fragments are serpentinite or peridotite throughout.

The B horizon has hue of 2.5YR and 5YR, value of 2 or 3 when moist and 3 to 5 when dry, and chroma of 4 to 6 when moist and 3 or 4 when dry. It is cobbly clay loam or cobbly clay and is 35 to 45 percent clay.

Brockman Variant

The Brockman Variant consists of deep, well drained soils on high stream terraces. These soils formed in alluvium derived dominantly from serpentinite and peridotite. Slopes are 0 to 3 percent. The mean annual precipitation is about 55 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Brockman Variant very gravelly loam, in an area of mixed conifers, about 1.5 miles northwest of O'Brien; approximately 300 feet north and 100 feet west of the southeast corner of sec. 14, T. 40 S., R. 9 W.

A1—0 to 4 inches; dark reddish brown (5YR 3/3) very gravelly loam, dark reddish brown (5YR 3/4) dry; weak very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine pores; 55 percent pebbles and 5 percent cobbles; medium acid; abrupt smooth boundary.
A3—4 to 12 inches; dark reddish brown (2.5YR 3/4) very gravelly loam, dark reddish brown (5YR 3/4) crushed, yellowish red (5YR 4/6) dry; weak very fine and fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and few fine roots; many very fine pores; 40 percent pebbles; slightly acid; clear smooth boundary.
B1—12 to 17 inches; dark reddish brown (5YR 3/4) gravelly clay loam, reddish brown (5YR 4/4) crushed, yellowish red (5YR 5/6) dry; weak fine subangular blocky structure parting to moderate very fine and fine granular; slightly hard, friable, sticky and plastic; common very fine roots and few fine and medium roots; many very fine interstitial pores and few very fine tubular pores; 20 percent pebbles; slightly acid; clear smooth boundary.

B21—17 to 27 inches; yellowish red (5YR 4/6) gravelly clay loam, strong brown (7.5YR 5/8) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots and few fine roots; few very fine tubular pores; 20 percent pebbles; neutral; gradual wavy boundary.
B22—27 to 35 inches; strong brown (7.5YR 4/6) gravelly loam, strong brown (7.5YR 5/8) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine tubular pores; 25 percent pebbles and 5 percent cobbles; neutral; gradual irregular boundary.
B3—35 to 62 inches; dark brown (7.5YR 4/4) very gravelly loam, yellowish brown (10YR 5/6) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine tubular pores; 30 percent pebbles and 20 percent highly weathered cobbles; neutral.

Depth to weathered bedrock is 60 inches or more. The control section averages 25 to 35 percent clay and 15 to 35 percent rock fragments, of which 10 to 25 percent is pebbles and 5 to 10 percent is cobbles.

The A horizon has hue of 5YR and 2.5YR and value of 2 to 4 when moist. It is 35 to 60 percent rock fragments, of which 35 to 55 percent is pebbles and 0 to 5 percent is cobbles. The A horizon averages 20 to 25 percent clay. It is medium acid to neutral.

Camas series

The Camas series consist of deep, excessively drained soils on flood plains. These soils formed in gravelly alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Camas gravelly sandy loam, about 7 miles south of Grants Pass along the Applegate River; approximately 540 feet west and 560 feet north of the southeast corner of sec. 21, T. 37 S., R. 5 W.

A1—0 to 10 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, grayish brown (10YR 5/2) dry; weak coarse and medium subangular blocky structure; soft, friable, nonsticky and nonplastic; many fine roots; many interstitial pores; 20 percent hard pebbles; medium acid; abrupt wavy boundary.
C—10 to 60 inches; variegated mostly brown (10YR 4/3), dark brown (10YR 3/3), and dark grayish brown (10YR 4/2) very gravelly sand; single grain; loose; 60 percent hard pebbles and 5 percent hard cobbles; slightly acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry.

The C horizon has hue of 10YR or 7.5YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 2 to 4 when moist or dry. It is sand or coarse sand. The horizon averages 50 to 85 percent rock fragments, of which 5 to 15 percent is cobbles.

Central Point series

The Central Point series consists of deep, well drained soils on low stream terraces and alluvial fans. These soils formed in alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Central Point sandy loam, near a cultivated area, about 5 miles west of Murphy along the Applegate River; approximately 840 feet south and 650 feet east of the northwest corner of sec. 16, T. 37 S., R. 6 W.

A11—0 to 3 inches; very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 5/3) dry; weak medium and fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots; common interstitial pores; 5 percent hard pebbles; medium acid; abrupt smooth boundary.
A12—3 to 15 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; few very fine tubular pores; 5 percent hard pebbles; medium acid; clear smooth boundary.
B2—15 to 36 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 5/3) dry; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine and medium roots; 10 percent hard pebbles; medium acid; abrupt smooth boundary.
C—36 to 60 inches; dark brown (10YR 3/3) gravelly sandy loam, brown (10YR 5/3) dry; massive; soft, very friable, nonsticky and nonplastic; 30 percent hard pebbles and 5 percent hard cobbles; medium acid.

Depth to bedrock is 60 inches or more. The control section averages 12 to 18 percent clay and 0 to 15 percent pebbles.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 1 to 3 when moist or dry.

The B2 horizon has value of 4 or 5 when dry and chroma of 2 or 3 when moist or dry.

The C horizon is sandy loam or loamy sand, and it is stratified in some pedons. The horizon averages 15 to 35 percent rock fragments.

Clawson series

The Clawson series consists of deep, somewhat poorly drained soils on alluvial fans and in drainageways. These soils formed in alluvium weathered from granitic rock. Slopes are 2 to 7 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Clawson sandy loam, 2 to 7 percent slopes, in a cultivated area, about one-half mile south of Grants Pass; approximately 710 feet north and 2,175 feet west of the southeast corner of sec. 19, T. 36 S., R. 5 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; moderate fine and very fine granular structure; soft, friable, slightly sticky and nonplastic; many very fine roots; many interstitial pores; slightly acid; abrupt smooth boundary.

B1—3 to 10 inches; dark grayish brown (10YR 4/2) sandy loam, light gray (10YR 7/1) dry; common fine prominent reddish brown (5YR 4/5) mottles; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; slightly acid; clear smooth boundary.

B2—10 to 16 inches; grayish brown (2.5Y 5/2) sandy loam, light gray (2.5Y 7/2) dry; common fine prominent reddish brown (5YR 4/4) mottles; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; few small black concretions; slightly acid; abrupt wavy boundary.

C1—16 to 32 inches; light brownish gray (2.5Y 6/2) sandy loam, white (2.5Y 8/2) dry; common fine prominent strong brown (7.5YR 5/6) mottles; massive; soft, very friable, nonsticky and nonplastic; common very fine tubular pores; common small black concretions; neutral; clear wavy boundary.

C2—32 to 46 inches; pale brown (10YR 6/3) coarse sandy loam, very pale brown (10YR 7/3) dry; common fine distinct brown (7.5YR 5/4) mottles; massive; soft, very friable, nonsticky and nonplastic; common very fine tubular pores; few small black concretions; neutral; clear wavy boundary.

C3—46 to 60 inches; light brown (7.5YR 6/3) and light brownish gray (10YR 6/2) coarse sandy loam, very pale brown (10YR 7/3) dry; common medium distinct strong brown (7.5YR 5/6) mottles; massive; soft, very friable, nonsticky and nonplastic; few very fine tubular pores; neutral.

Depth to bedrock is 60 inches or more. The profile commonly is saturated to the surface for at least a month during most years, and it commonly is saturated below a depth of 40 inches throughout the year. The control section averages 8 to 18 percent clay.

The A horizon has hue of 10YR or 2.5Y, value of 2 to 4 when moist and 5 or 6 when dry, and chroma of 2 or less when moist or dry.

The B horizon has value of 6 or 7 when dry, and it has chroma of 2 or less when moist or dry. It is distinctly mottled or prominently mottled.

The C horizon has hue of 2.5Y and 10YR, value of 5 or 6 when moist and 6 to 8 when dry, and chroma of 2 or 3 when moist or dry. It is sandy loam or coarse sandy loam to a depth of 40 inches and is faintly mottled to prominently mottled. The C horizon is coarse sandy loam, loamy sand, or loam below a depth of 40 inches.

Colestine series

The Colestine series consists of moderately deep, well drained soils on mountainsides. These soils formed in colluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 50 to 80 percent. The mean annual precipitation is 45 inches, and the mean annual air temperature is 49 degrees F.

Typical pedon of Colestine gravelly loam, in a forested area of Beekman-Colestine complex, 50 to 75 percent south slopes, about 1 mile southwest of Golden; approximately 900 feet east and 775 feet south of the northwest corner of sec. 31, T. 33 S., R. 5 W.

A11—0 to 4 inches; dark brown (10YR 3/3) gravelly loam, yellowish brown (10YR 5/4) dry; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many interstitial pores; 30 percent angular pebbles; neutral; abrupt smooth boundary.

A12—4 to 12 inches; dark brown (10YR 3/3) gravelly loam, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium and coarse roots; many very fine and fine tubular pores; 30 percent angular pebbles; slightly acid; clear smooth boundary.

B21—12 to 24 inches; yellowish brown (10YR 5/4) gravelly clay loam, very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; few medium and coarse roots; common very fine tubular pores; 25 percent angular pebbles; slightly acid; gradual smooth boundary.

B22—24 to 34 inches; yellowish brown (10YR 5/6) gravelly clay loam, very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common fine and very fine tubular pores; common bleached sand and silt coatings on peds; 20 percent angular pebbles; slightly acid; clear wavy boundary.

R—34 inches; fractured metamorphic bedrock.

Depth to highly fractured bedrock is 20 to 40 inches.

The A horizon has value of 3 or 4 when moist and 4 to 6 when dry, and it has chroma of 2 to 4 when moist and 3 or 4 when dry.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 3 to 6 when moist or dry. It is loam or clay loam. The B horizon is 22 to 30 percent clay, 15 to 30 percent angular pebbles, and 0 to 15 percent angular cobbles. Content of coarse fragments is 35 percent or less.

Copsey series

The Copsey series consists of deep, poorly drained soils in drainageways. These soils formed in alluvium derived from serpentinite or peridotite. Slopes are 0 to 7 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Copsey clay, 3 to 7 percent slopes, in an area of grassland, about 300 yards north of Colonial Valley Golf Course and 5 yards west of Horseshoe Drive; approximately 315 feet south and 1,675 feet east of the northwest corner of sec. 30, T. 35 S., R. 5 W.

A11—0 to 5 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; strong fine and very fine subangular blocky structure; extremely hard, very firm, very sticky and very plastic; many very fine roots; 10 percent pebbles; slightly acid; abrupt smooth boundary.

A12—5 to 18 inches; black (10YR 2/1) clay, very dark gray (10YR 3/1) dry; weak coarse prismatic structure parting to moderate coarse subangular blocky; extremely hard, very firm, very sticky and very plastic; common fine, medium, and coarse roots; 10 percent pebbles; slightly acid; clear wavy boundary.

AC1—18 to 28 inches; very dark brown (10YR 2/2) gravelly clay, very dark grayish brown (10YR 3/2) dry; very fine and fine distinct dark brown (7.5YR 3/4) mottles; common thin black (10YR 2/1) coatings on peds; weak medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few medium roots; 30 percent pebbles and 5 percent cobbles; slightly acid; clear wavy boundary.

AC2—28 to 40 inches; very dark brown (10YR 2/2) gravelly light clay, very dark grayish brown (10YR 3/2) dry; many very fine and fine dark brown (7.5YR 3/4) mottles; massive; very hard, firm, very sticky and very plastic; few medium roots; 15 percent pebbles and a few cobbles; slightly acid; gradual wavy boundary.

C—40 to 60 inches; very dark brown (10YR 3/2) gravelly light clay, dark grayish brown (10YR 4/2) dry; many fine distinct dark reddish brown (5YR 3/4) mottles; massive; very hard, firm, very sticky and very plastic; 20 percent pebbles and 5 percent cobbles; slightly acid.

Depth to bedrock is 60 inches or more. The profile is saturated 4 to 6 months of the year and remains moist almost continuously unless drained. During summer, the soil cracks to a depth of less than 20 inches, usually between 7 and 20 inches.

The A horizon has a hue of 2.5Y or 10YR, value of 2 or 3 when moist and 3 or 4 when dry, and chroma of less than 1.5. It averages 0 to 30 percent serpentinite pebbles.

The AC and C horizons have hue of 10YR or 2.5Y, value of 2 or 3 when moist and 3 or 4 when dry, and chroma of 1 or 2 when moist or dry. They average 15 to 30 percent pebbles and 5 to 10 percent cobbles, mostly serpentinite.

Cornutt series

The Cornutt series consists of deep, well drained soils on mountainsides and alluvial fans. These soils formed in alluvium and colluvium weathered from mixed ultramafic rock and altered sedimentary and extrusive igneous rock. Slopes are 7 to 55 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of a Cornutt cobbly clay loam in a forested area of Cornutt-Dubakella complex, 35 to 55 percent south slopes, about one-half mile off Granite Hill Road along the logging road; approximately 250 feet west and 610 feet north of the southeast corner of sec. 20, T. 35 S., R. 5 W.

O1—1/2 inch to 0; partially decomposed conifer needles and forest litter.

A1—0 to 5 inches; dark reddish brown (5YR 3/3) cobbly clay loam, light brown (7.5YR 6/4) dry; moderate very fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine and medium roots; many very fine tubular pores; 20 percent cobbles, 10 percent pebbles, and 5 percent stones; slightly acid; clear smooth boundary.

B1—5 to 11 inches; dark reddish brown (5YR 3/4) and reddish brown (5YR 4/4) cobbly clay loam, light brown (7.5YR 6/4) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; many fine and medium roots; many very fine and fine tubular pores; 15 percent cobbles and 10 percent pebbles; medium acid; clear smooth boundary.

IIB21t—11 to 21 inches; dark red (2.5YR 3/6) clay, red (2.5YR 5/6) dry; weak medium prismatic structure parting to moderate coarse subangular blocky; extremely hard, very firm, very sticky and very plastic; common medium and coarse roots; many very fine tubular pores; few black stains; common thin yellowish red (5YR 3/6) clay films; 10 percent

partially weathered pebbles and 5 percent partially weathered cobbles; slightly acid; gradual wavy boundary.

IIB22t—21 to 41 inches; dark reddish brown (5YR 3/4) clay, reddish brown (5YR 5/4) dry; weak medium prismatic structure parting to moderate coarse subangular blocky; extremely hard, very firm, very sticky and very plastic; common medium and coarse roots; common very fine tubular pores; few black stains; common thin yellowish red (5YR 3/6) clay films and few moderately thick yellowish red (5YR 3/6) clay films; 10 percent partially weathered pebbles and 5 percent partially weathered cobbles; slightly acid; clear wavy boundary.

IICr—41 inches; weathered metavolcanic bedrock; thick dark red (2.5YR 3/6) clay films in fractures.

Depth to bedrock is 40 to 60 inches. Mineralogy dominantly is mixed, although there is a sufficient amount of ultramafic mineral to influence plant growth.

The A horizon has hue of 5YR or 7.5YR, value of 2 or 3 when moist and 4 to 6 when dry; and chroma of 3 or 4 when moist and 4 to 6 when dry. It averages 0 to 5 percent stones, 10 to 20 percent cobbles, and 5 to 15 percent pebbles.

The Bt horizon has value of 4 to 6 when dry, and it has chroma of 4 to 6 when moist or dry. It averages 40 to 55 percent clay. The horizon averages 0 to 20 percent partially weathered cobbles and 10 to 20 percent partially weathered pebbles.

Cove series

The Cove series consists of deep, poorly drained soils on bottom lands in basinlike areas. These soils formed in recent alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 40 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Cove silty clay loam in a cultivated area near Agnew Mill on the east edge of Grants Pass; approximately 580 feet north and 125 feet east of the southwest corner of sec. 16, T. 36 S., R. 5 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; common fine distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots; many fine tubular pores; slightly acid; abrupt smooth boundary.

B2g—8 to 27 inches; very dark gray (2.5Y 3/1) silty clay, gray (2.5Y 5/1) dry; many fine distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate fine angular blocky; hard, firm, very sticky and very plastic; common fine and very fine roots; common very fine tubular pores; few very fine black concretions; neutral; clear wavy boundary.

B3—27 to 42 inches; dark grayish brown (2.5Y 4/2) silty clay, grayish brown (2.5Y 5/2) dry; many fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium prismatic structure; very hard, firm, sticky and plastic; many fine tubular pores; few very fine black sand-sized concretions; slightly acid; gradual wavy boundary.

C—42 to 60 inches; dark grayish brown (2.5Y 4/2) and dark gray (10YR 4/1) silty clay, grayish brown (2.5Y 5/2) dry; many dark yellowish brown (10YR 4/4) mottles; massive; very hard, firm, sticky and plastic; slightly acid.

Depth to bedrock is 60 inches or more. The rooting depth is limited by a seasonal water table that is at a depth of less than 20 inches in some areas. The profile is saturated with water during the winter, and it remains moist below a depth of 20 inches nearly continuously unless artifically drained. During the summer, the soil cracks to a depth of less than 20 inches, usually between 7 and 20 inches.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 0 to 3 when moist or dry.

The B horizon has hue of 2.5Y or 10YR, value of 2 to 4 when moist and 4 or 5 when dry, and chroma of 0 to 2 when moist or dry. It is clay or silty clay and averages less than 5 percent rock fragments.

Crannler series

The Crannler series consists of moderately deep, somewhat excessively drained soils on mountainsides. These soils formed in colluvium and residuum derived from granitic rock. Slopes are 50 to 100 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 41 degrees F.

Typical pedon of Crannler very stony sandy loam, 50 to 90 percent slopes, in a forested area, about 2 miles southeast of the Oregon Caves National Monument; approximately 1,360 feet south and 320 feet east of the northwest corner of sec. 23, T. 40 S., R. 6 W.

A—0 to 4 inches; very dark brown (10YR 2/2) very stony sandy loam, black (10YR 2/1) crushed, dark grayish brown (10YR 4/2) dry; weak very fine and fine granular structure; soft, friable, nonsticky and nonplastic; many very fine and fine roots; many very fine pores; 15 percent pebbles, 5 percent cobbles, and 30 percent stones; 3 percent of the surface is covered with stones; slightly acid; clear wavy boundary.

C1—4 to 14 inches; very dark grayish brown (10YR 3/2) extremely stony sandy loam, brown (10YR 5/3) dry; massive; soft, very friable, nonsticky and nonplastic; many fine roots and common medium and coarse roots; many very fine pores; 5 percent pebbles, 10 percent cobbles, and 50 percent stones; medium acid; gradual wavy boundary.

C2—14 to 32 inches; dark brown (10YR 3/3) extremely stony sandy loam, brown (10YR 5/3) dry; massive; soft, very friable, nonsticky and nonplastic; common coarse roots and few medium roots; many pores; 5 percent pebbles, 10 percent cobbles, and 60 percent stones; medium acid.
R—32 inches; fractured quartz-diorite.

Depth to bedrock is 20 to 40 inches. The control section averages less than 10 percent clay and 50 to 85 percent rock fragments, of which 35 to 70 percent is cobbles and stones.

The A horizon has chroma of 1 or 2 when moist. It averages 30 to 70 percent rock fragments, of which 15 to 35 percent is cobbles and stones.

The C horizon has value of 3 or 4 when moist and 4 to 6 when dry, and it has chroma of 1 to 3 when moist and 2 or 3 when dry.

Cryaquepts

Cryaquepts consist of deep and moderately deep, poorly drained and somewhat poorly drained soils on mountainsides and in drainage basins. These soils formed in alluvium and colluvium weathered from granitic rock. Slopes are 0 to 30 percent. The mean annual precipitation is about 65 inches, and the mean annual air temperature is about 41 degrees F.

Reference pedon of Cryaquepts, 0 to 30 percent slopes, in a meadow area of a drainage basin, about 2 miles east of the Oregon Caves National Monument; approximately 1,020 feet south and 60 feet west of the southeast corner of sec. 14, T. 40 S., R. 6 W.

A—0 to 18 inches; very dark brown (10YR 2/2) silt loam, dark brown (7.5YR 3/2) dry; weak very fine granular structure; soft, friable, nonsticky and slightly plastic; many very fine roots; many very fine pores; slightly acid; clear wavy boundary.
C1—18 to 25 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 3/3) mottles; massive; soft, friable, nonsticky and nonplastic; many very fine roots; many very fine pores; slightly acid; clear wavy boundary.
C2—25 to 38 inches; very dark brown (10YR 2/2) gravelly silt loam, dark gray (10YR 4/1) dry; massive; soft, friable, slightly sticky and slightly plastic; few roots; few pores; 25 percent pebbles; medium acid; clear wavy boundary.
C3—38 to 60 inches; very dark brown (10YR 2/2) very gravelly loam, dark gray (10YR 4/1) dry; massive; soft, friable, slightly sticky and slightly plastic; few pores; 35 percent pebbles and 5 percent cobbles; medium acid.

Depth to bedrock is 20 to 60 inches or more. The control section averages 15 to 40 percent pebbles, 0 to 10 percent cobbles, and 12 to 27 percent clay.

The A horizon has value of 2 or 3 when moist and 3 to 5 when dry, and it has chroma of 1 or 2 when moist or dry.

The C horizon has value of 2 or 3 when moist and 4 to 6 when dry, and it has chroma of 1 or 2 when moist or dry. It is silt loam, loam, or sandy loam. The horizon averages 0 to 40 percent pebbles and 0 to 10 percent cobbles.

Cryumbrepts

Cryumbrepts consists of very shallow to moderately deep, somewhat excessively drained and well drained soils on mountainsides. These soils formed in colluvium weathered from granitic rock. Slopes are 20 to 75 percent. The mean annual precipitation is about 70 inches, and the mean annual air temperature is about 41 degrees F.

Reference pedon of Cryumbrepts, very steep, in a grazed area on a mountainside about 3 miles east of the Oregon Caves National Monument; approximately 1,100 feet south and 780 feet west of the northwest corner of sec. 13, T. 40 S., R. 6 W.

A—0 to 2 inches; dark brown (7.5YR 3/3) gravelly sandy loam, dark brown (10YR 4/3) dry; weak very fine and fine granular structure; soft, friable, nonsticky and nonplastic; common very fine roots; many very fine pores; 35 percent pebbles; slightly acid; clear wavy boundary.
B2—2 to 12 inches; dark brown (7.5YR 3/3) gravelly sandy loam, brown (7.5YR 4/3) dry; weak fine subangular blocky structure; soft, friable, nonsticky and nonplastic; few very fine roots; many very fine pores; 35 percent pebbles; medium acid; clear wavy boundary.
C—12 to 25 inches; dark brown (7.5YR 3/4) very gravelly sandy loam, brown (7.5YR 4/4) dry; massive; soft, friable, nonsticky and nonplastic; few very fine roots; many very fine pores and few fine pores; 40 percent pebbles, 10 percent cobbles, and 5 percent stones; medium acid; abrupt irregular boundary.
R—25 inches; fractured granite.

Depth to bedrock is 7 to 40 inches. The control section averages 20 to 60 percent rock fragments and less than 18 percent clay.

The A horizon has hue of 10YR or 7.5YR when moist or dry, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry.

The B horizon has hue of 10YR or 7.5YR when moist or dry, value of 4 or 5 when dry, and chroma of 3 or 4 when dry. It is sandy loam, loam, or loamy sand. The horizon is 15 to 40 percent pebbles and 0 to 10 percent cobbles.

The C horizon, where present, has hue of 7.5YR or 10YR when moist or dry, value of 3 or 4 when moist and

4 to 6 when dry, and chroma of 3 or 4 when moist or dry. It is sandy loam, loam, or loamy sand. The horizon is 20 to 60 percent rock fragments.

Debenger series

The Debenger series consists of moderately deep, well drained soils on hillsides and alluvial fans. These soils formed in colluvium and alluvium weathered from sedimentary rock. Slopes are 7 to 20 percent. The mean annual precipitation is about 30 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Debenger loam, 12 to 20 percent slopes, in an idle area, about 4 miles south of Grants Pass along Cloverlawn Drive; approximately 2,000 feet east and 1,580 feet north of the southwest corner of sec. 5, T. 37 S., R. 5 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many fine tubular pores; medium acid; abrupt smooth boundary.

A3—4 to 11 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine tubular pores; few clear sand grains on peds; medium acid; clear smooth boundary.

B1—11 to 18 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium roots; many very fine tubular pores; medium acid; clear smooth boundary.

B2—18 to 28 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few coarse roots; many very fine tubular pores; common dark brown (10YR 3/3) coatings on peds; few thin reddish brown (5YR 4/4) clay films in pores; 15 percent small weathered pebbles; strongly acid; clear wavy boundary.

Cr—28 inches; dark grayish brown (10YR 4/2) saprolite derived from metamorphosed bedrock; common moderately thick reddish brown (5YR 5/4) clay films in fractures.

Depth to weathered bedrock is 20 to 40 inches. The control section averages 20 to 35 percent clay and 0 to 15 percent pebbles.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 when moist and 5 or 6 when dry, and chroma of 2 or 3 when moist or dry.

The B horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry, and chroma of 3 or 4 when moist or dry. It is loam or clay loam.

Dubakella series

The Dubakella series consists of moderately deep, well drained soils on mountainsides and ridgetops. These soils formed in colluvium and residuum derived from serpentinite. Slopes are 7 to 75 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of a Dubakella very cobbly clay loam in a forested area of Cornutt-Dubakella complex, 35 to 55 percent south slopes, about 2 miles northeast of Hugo; approximately 1,130 feet west and 1,880 feet north of the southeast corner of sec. 24, T. 34 S., R. 6 W.

A1—0 to 2 inches; dark yellowish brown (10YR 3/4) very cobbly clay loam, yellowish brown (10YR 5/4) dry; weak very fine and fine subangular blocky structure, slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine pores; 25 percent pebbles, 25 percent cobbles, and 5 percent stones; neutral; clear smooth boundary.

B1—2 to 7 inches; dark reddish brown (5YR 3/4) very cobbly clay loam, brown (7.5YR 5/5) dry; moderate fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few fine and medium roots and many very fine roots; few very fine tubular pores; few thin clay films in tubular pores and on peds; 25 percent pebbles, 15 percent cobbles, and 5 percent stones; neutral; clear wavy boundary.

B21t—7 to 16 inches; dark reddish brown (5YR 3/4) very cobbly clay loam, reddish brown (5YR 5/5) dry; moderate fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; common very fine roots and few fine roots; few very fine tubular pores; common thin clay films in tubular pores, on peds, and on rock fragments; 30 percent pebbles, 25 percent cobbles, and 10 percent stones; neutral; clear irregular boundary.

B22t—16 to 28 inches; dark reddish brown (5YR 3/4) extremely cobbly clay, reddish brown (5YR 4/4) crushed, yellowish red (10YR 5/6) dry; moderate fine and medium angular blocky structure; hard, firm, very sticky and very plastic; few roots; common very fine tubular pores; common stress cutans on peds, common thin clay films in tubular pores and on rock fragments; 20 percent pebbles, 30 percent cobbles, and 25 percent stones; neutral.

R—28 inches; fractured and partially decomposed serpentinite.

Depth to bedrock is 20 to 40 inches. The control section averages 35 to 75 percent rock fragments, of which 15 to 55 percent is cobbles and stones.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5 when dry, and chroma of 3 or 4 when moist or dry.

The B horizon has hue of 7.5YR or 5YR, value of 3 or 4 when moist and 4 or 5 when dry, and chroma of 4 or 5 when moist and 5 or 6 when dry. It is clay loam or clay.

Eightlar series

The Eightlar series consists of deep, moderately well drained soils on alluvial fans and mountainsides. These soils formed in colluvium or alluvium weathered from peridotite and serpentinite. Slopes are 5 to 65 percent. The mean annual precipitation is about 60 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of an Eightlar extremely stony clay in a forested area of Eightlar-Dubakella complex, 35 to 65 percent south slopes, about 4 miles southwest of Selma; approximately 1,900 feet south and 1,800 feet east of the northwest corner of sec. 28, T. 38 S., R. 8 W.

A11—0 to 3 inches; dark reddish brown (5YR 3/3) extremely stony clay, dark reddish brown (5YR 3/2) dry; strong very fine and fine subangular blocky structure; hard, firm, very sticky and very plastic; common very fine roots; many very fine pores; 15 percent pebbles, 20 percent cobbles, and 30 percent stones; neutral; clear wavy boundary.

A12—3 to 10 inches; dark reddish brown (5YR 3/3) extremely stony clay, (5YR 3/4) crushed, dark reddish brown (5YR 3/3) dry; strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; common very fine roots and few fine roots; many very fine pores; 15 percent pebbles, 20 percent cobbles, and 20 percent stones; neutral; clear wavy boundary.

B1—10 to 19 inches; dark reddish brown (5YR 3/3) extremely stony clay, (5YR 3/4) crushed, dark reddish brown (5YR 3/3) dry; strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; common very fine roots and few fine roots; many very fine tubular pores and few fine tubular pores; many stress cutans on peds; 20 percent pebbles, 25 percent cobbles, and 25 percent stones; neutral; clear wavy boundary.

B2—19 to 29 inches; dark reddish brown (5YR 3/4) and dark brown (7.5YR 3/4) very stony clay, dark brown (7.5YR 3/4) dry; strong medium prismatic structure parting to weak coarse and medium subangular blocky; very hard, very firm, very sticky and very plastic; few very fine and fine roots; common very fine tubular pores; many stress cutans on peds; 15 percent pebbles, 10 percent cobbles, and 35 percent stones; neutral; clear irregular boundary.

B3—29 to 44 inches; dark brown (7.5YR 3/2) and (10YR 3/3) extremely stony clay, brown (7.5YR 4/4) dry; dark brown (7.5YR 3/2, dry) coatings; moderate fine and medium angular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; many stress cutans on peds and common thick clay films on peds and pebbles and in root channels; 20 percent pebbles, 10 percent cobbles, and 40 percent stones; neutral; gradual irregular boundary.

C—44 to 61 inches; dark brown (7.5YR 3/2) and (10YR 3/3) extremely stony clay, brown (7.5YR 4/4) dry; dark brown (7.5YR 3/2, dry) coatings; massive; hard, firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; many thick clay films on coarse fragments; 20 percent pebbles, 10 percent cobbles, and 40 percent stones; neutral.

Depth to bedrock is 60 inches or more. The control section averages 55 to 65 percent clay and 40 to 80 percent rock fragments, of which 20 to 50 percent is cobbles and stones.

The A horizon has hue of 2.5YR or 5YR, value of 3 or 4 when moist or dry, and chroma of 3 or 4 when moist and 2 to 4 when dry.

The B horizon has hue of 5YR or 7.5YR, value of 3 or 4 when moist or dry, and chroma of 3 to 6 when moist and 2 to 4 when dry.

The C horizon has hue of 5YR or 7.5YR, value of 3 or 4 when dry, and chroma of 2 to 4 when moist and 3 or 4 when dry. It averages 15 to 25 percent pebbles and 25 to 55 percent cobbles and stones.

Evans series

The Evans series consists of deep, well drained soils on flood plains. These soils formed in recent alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Evans loam, in a cultivated area, about 5 miles west of Grants Pass on Upper River Road; approximately 2,260 feet north and 2,260 feet east of the southwest corner of sec. 17, T. 36 S., R. 6 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; weak fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many interstitial pores; medium acid; abrupt smooth boundary.

A12—9 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many interstitial pores; medium acid; clear smooth boundary.

A13—12 to 23 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak coarse subangular blocky structure and moderate very fine granular; slightly hard, friable, slightly sticky and slightly plastic; many interstitial pores; slightly acid; gradual smooth boundary.

C1—23 to 37 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; many interstitial pores; slightly acid; gradual smooth boundary.

C2—37 to 64 inches; dark brown (10YR 3/3) very fine sandy loam, brown (10YR 5/3) dry; massive; soft, very friable, slightly sticky and slightly plastic; common interstitial pores; slightly acid.

Depth to bedrock is 60 inches or more. The control section is less than 18 percent clay and more than 15 percent particles coarser than very fine sand. The mollic epipedon is 20 inches thick or more.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3 when moist and 2 to 4 when dry.

The C horizon has value of 3 or 4 when moist and 4 to 6 when dry, and it has chroma of 3 or 4 when dry. It is loam, silt loam, or very fine sandy loam.

Fantz series

The Fantz series consists of moderately deep, well drained soils on mountainsides. These soils formed in colluvium weathered from olivine gabbro. Slopes are 35 to 100 percent. The mean annual precipitation is about 60 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of a Fantz very gravelly loam in a forested area of Fantz-Knapke complex, 35 to 85 percent north slopes, about 9 miles west-northwest of Selma; approximately 840 feet east and 800 feet north of the southwest corner of sec. 21, T. 37 S., R. 9 W.

O1—1 inch to 0; partially decomposed twigs, needles, and leaves.

A11—0 to 4 inches; very dark brown (10YR 2/2) very gravelly loam, black (10YR 2/1) crushed, dark grayish brown (10YR 4/2) dry; weak very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine pores; 55 percent pebbles; slightly acid; clear smooth boundary.

A12—4 to 12 inches; very dark grayish brown (10YR 3/2) very gravelly loam, brown (10YR 5/3) dry; weak fine subangular blocky structure and weak fine granular; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots, common medium roots, and few coarse roots; many very fine and fine pores; 55 percent pebbles; slightly acid; gradual wavy boundary.

C1—12 to 29 inches; dark brown (10YR 3/3) extremely cobbly loam, brown (10YR 5/3) dry; massive; soft, very friable, slightly sticky and slightly plastic; few roots; many pores; 35 percent pebbles and 40 percent cobbles; neutral; clear wavy boundary.

R—29 inches; highly fractured unweathered olivine gabbro; few roots extending into fractures.

Depth to bedrock is 20 to 40 inches. The control section averages 18 to 27 percent clay and 45 to 80 percent rock fragments, of which 0 to 45 percent is cobbles. Rock fragments are dominantly olivine gabbro.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 1 or 2 when moist and 2 or 3 when dry. It averages 35 to 60 percent rock fragments, of which 0 to 10 percent is cobbles.

The C horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3 when moist or dry.

Foehlin series

The Foehlin series consists of deep, well drained soils on alluvial fans and low terraces. These soils formed in alluvium of mixed origin. Slopes are 0 to 12 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Foehlin gravelly loam, 3 to 12 percent slopes, in an orchard, about one-half mile northeast of Hugo; approximately 2,025 feet west and 775 feet south of the northeast corner of sec. 27, T. 34 S., R. 6 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) gravelly loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; 20 percent pebbles; slightly acid.

A12—7 to 13 inches; very dark grayish brown (10YR 3/2) gravelly loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many very fine pores; 20 percent pebbles; slightly acid; clear wavy boundary.

B21t—13 to 25 inches; dark brown (10YR 3/3) gravelly clay loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine, fine, and medium roots; many very fine and fine pores; few thin dark brown (7.5YR 3/4) clay films on peds; 15 percent pebbles; slightly acid; gradual wavy boundary.

B22t—25 to 48 inches; dark brown (10YR 3/3) gravelly clay loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine, fine, and medium roots; many very fine and fine pores; common moderately thick dark brown (7.5YR 4/3, dry) clay films on peds; common light gray coarse sand grains; 20 percent pebbles; slightly acid; gradual smooth boundary.

B23t—48 to 60 inches; brown (10YR 4/3) clay loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine pores; common moderately thick dark brown (7.5YR 4/3) and reddish brown (5YR 4/3, dry) clay films on peds; common light gray coarse sand grains; 10 percent pebbles; slightly acid; gradual smooth boundary.

C—60 to 66 inches; brown (10YR 4/3) gravelly clay loam, pale brown (10YR 6/3) dry; massive; hard, firm, sticky and plastic; few very fine pores; few moderately thick reddish brown clay films in pores and fractures; 25 percent pebbles; slightly acid.

Depth to weathered bedrock is 60 inches or more. The control section averages 10 to 30 percent pebbles.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry.

The B2t and C horizons have hue of 7.5YR or 10YR, value of 5 or 6 when dry, and chroma of 3 or 4 when moist or dry. The B2t horizon averages 27 to 35 percent clay.

Goodwin series

The Goodwin series consists of deep, well drained soils on mountainsides. These soils formed in colluvium weathered from granitic rock. Slopes are 5 to 70 percent. The mean annual precipitation is about 60 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Goodwin very stony sandy loam, 35 to 65 percent north slopes, in a forested area, about 11 miles east of Holland; approximately 420 feet south and 360 feet east of the northwest corner of sec. 32, T. 39 S., R. 5 W.

O1—3 inches to 1 inch; undecomposed needles, leaves, and twigs.

O2—1 inch to 0; black (10YR 2/1) highly decomposed litter.

A1—0 to 4 inches; very dark brown (10YR 2/2) very stony sandy loam, dark grayish brown (10YR 4/2) dry; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine pores; 45 percent pebbles, 5 percent cobbles, and 10 percent stones; 2 percent of surface is covered with stones; medium acid; clear wavy boundary.

A3—4 to 16 inches; dark brown (10YR 3/3) very gravelly sandy loam, brown (10YR 5/3) dry; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine pores; 45 percent pebbles, 10 percent cobbles, and 5 percent stones; medium acid; gradual wavy boundary.

B2—16 to 40 inches; dark brown (10YR 4/3) extremely gravelly sandy loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and fine pores; 40 percent pebbles, 15 percent cobbles, and 15 percent stones; medium acid; gradual wavy boundary.

C—40 to 55 inches; olive brown (2.5Y 4/4) very gravelly sandy loam, pale brown (10YR 6/3) dry; massive; soft, friable, slightly sticky and slightly plastic; few very fine, fine, and coarse roots; many very fine pores; 45 percent pebbles, 10 percent cobbles, and 5 percent stones; medium acid; abrupt wavy boundary.

Cr—55 inches; highly decomposed grus derived from quartz-diorite.

Depth to weathered bedrock is 40 to 60 inches. The control section is 5 to 15 percent clay. It averages 35 to 80 percent rock fragments, of which 5 to 35 percent is cobbles and stones.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 1 to 3 when moist and 2 or 3 when dry.

The B horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 5 or 6 when dry, chroma of 3 or 4 when moist or dry. It is loam or sandy loam and is more than 35 percent rock fragments.

The C horizon has hue of 10YR and 2.5Y, value of 3 or 4 when moist, and chroma of 3 or 4 when moist. It is loam or sandy loam. The horizon averages 35 to 50 percent pebbles and 10 to 30 percent cobbles and stones.

Holland series

The Holland series consists of deep, well drained soils on hillsides. These soils formed in colluvium weathered from granitic rock. Slopes are 2 to 35 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Holland sandy loam, cool, 12 to 20 percent slopes, in a forested area, about 7 miles northwest of Grants Pass; approximately 2,150 feet south and 2,675 feet east of the northwest corner of sec. 4, T. 36 S., R. 6 W.

O1—1/2 inch to 0; partially decomposed needles and leaves.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) sandy loam, pale brown (10YR 6/3) dry; weak very fine and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; many fine pores; slightly acid; abrupt smooth boundary.

A3—4 to 8 inches; brown (7.5YR 5/3) sandy loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine roots; common very fine pores; medium acid; clear smooth boundary.

B1—8 to 14 inches; brown (7.5YR 5/4) sandy loam, pink (7.5YR 7/3) dry; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; common very fine pores; medium acid; clear wavy boundary.

B2t—14 to 28 inches; yellowish red (5YR 4/6) sandy clay loam, reddish yellow (7.5YR 6/6) dry; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few roots; common very fine and fine pores; few moderately thick clay films; medium acid; gradual wavy boundary.
B31t—28 to 34 inches; yellowish red (5YR 5/6) sandy loam, reddish yellow (7.5YR 6/6) dry; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few roots; common fine interstitial and tubular pores; common moderately thick clay films; medium acid; gradual wavy boundary.
B32—34 to 49 inches; strong brown (7.5YR 5/6) sandy loam, pink (7.5YR 7/4) dry; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few roots; many fine pores; few moderately thick clay films; strongly acid; gradual wavy boundary.
Cr—49 inches; saprolite from granodiorite; moderately thick clay films in fractures.

Depth to weathered bedrock generally is 40 to 60 inches, but it is more than 60 inches in some pedons. The control section averages 22 to 30 percent clay and 0 to 10 percent pebbles.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5 when moist and 5 to 7 when dry, and chroma of 2 to 4 when moist or dry. It averages 0 to 10 percent pebbles.

The B horizon has hue of 5YR or 7.5YR, value of 3 to 6 when moist and 5 to 7 when dry, and chroma of 4 to 6 when moist and 3 to 6 when dry. It is sandy loam or sandy clay loam.

Jayar series

The Jayar series consists of moderately deep, well drained soils on mountainsides and rounded ridgetops. These soils formed in colluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 20 to 90 percent. The mean annual precipitation is about 55 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Jayar very gravelly loam, 35 to 70 percent north slopes, in a forested area, about 380 feet west and 1,450 feet north of the southeast corner of sec. 23, T. 33 S., R. 5 W.

O1—1 inch to 0; loose litter of needles, leaves, bark, and lichens.
A1—0 to 3 inches; dark yellowish brown (10YR 3/4) very gravelly loam, yellowish brown (10YR 5/4) dry; strong very fine granular structure; slightly hard, friable, nonsticky and nonplastic; many fine, medium, and coarse roots; many interstitial pores; 55 percent pebbles and 5 percent cobbles; medium acid; clear smooth boundary.
B1—3 to 14 inches; dark brown (7.5YR 4/4) very gravelly loam, light yellowish brown (10YR 6/4) dry; moderate fine subangular blocky structure and moderate very fine granular; slightly hard, friable, nonsticky and nonplastic; many fine, medium, and coarse roots; many very fine tubular and interstitial pores; 55 percent pebbles and 5 percent cobbles; slightly acid; gradual wavy boundary.
B2—14 to 31 inches; dark brown (7.5YR 4/4) extremely gravelly loam, light yellowish brown (10YR 6/4) dry; moderate fine subangular blocky structure and moderate very fine granular; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine tubular pores; 55 percent pebbles and 25 percent cobbles; slightly acid; gradual irregular boundary.
R—31 inches; fractured metavolcanic bedrock.

Depth to bedrock ranges from 20 to 40 inches. The control section is 35 to 80 percent rock fragments.

The A horizon has hue of 10YR or 7.5YR, value of 2 to 4 when moist and 5 or 6 when dry, and chroma of 2 to 4 when moist or dry. It is 85 percent rock fragments or less, of which 35 to 70 percent is pebbles and 0 to 25 percent is cobbles.

The B horizon has value of 3 to 5 when moist and 5 to 7 when dry, and it has chroma of 3 to 6 when moist or dry. It is loam or clay loam and averages 18 to 30 percent clay. The horizon is 85 percent or less rock fragments, of which 25 to 70 percent is pebbles and 0 to 30 percent is cobbles.

Jerome series

The Jerome series consists of deep, somewhat poorly drained soils on alluvial fans and in drainageways. The soils formed in alluvium weathered from granitic rock. They are underlain by a buried soil. Slopes are 0 to 3 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Jerome sandy loam, in a pasture, about one-half mile south of Grants Pass, 400 feet south of Union Avenue, and 100 feet west of the Williams Highway (Oregon Highway 238); approximately 1,800 feet west and 850 feet north of the southeast corner of sec. 19, T. 36 S., R. 5 W.

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) sandy loam, light brownish gray (10YR 6/2) dry; moderate fine and very fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots; many interstitial pores; 5 percent small pebbles; slightly acid; abrupt smooth boundary.
A12—5 to 10 inches; brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; few fine distinct strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine and

medium roots; common fine and very fine tubular pores; 5 percent small pebbles; neutral; abrupt smooth boundary.

B2—10 to 17 inches; gray (10YR 5/1) sandy loam, gray (10YR 6/1) dry; many fine prominent yellowish red (5YR 3/5) mottles; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and medium roots; common very fine tubular pores; neutral; clear wavy boundary.

C1—17 to 32 inches; light brownish gray (2.5Y 6/2) sandy loam, light gray (10YR 7/1) dry; common medium prominent yellowish red (5Y 4/6) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; few fine and very fine tubular pores; neutral; abrupt wavy boundary.

C2—32 to 35 inches; grayish brown (2.5Y 5/2) sandy loam, white (2.5Y 8/2) dry; many fine prominent strong brown (7.5YR 5/6) mottles; massive; soft, very friable, nonsticky and nonplastic; few fine and medium roots; 15 percent small pebbles; slightly acid; abrupt smooth boundary.

IIB2tb—35 to 48 inches; dark grayish brown (2.5Y 4/2) silty clay, grayish brown (2.5Y 5/2) dry; common large distinct very dark grayish brown (10YR 3/2) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; very hard, firm, very sticky and very plastic; few very fine tubular pores; few moderately thick weak red (2.5YR 5/1) clay films on vertical faces of peds; neutral; gradual wavy boundary.

IIB3tb—48 to 64 inches; brown (7.5YR 4/3) clay, brown (10YR 5/3) dry; common medium prominent dark gray (2.5Y 4/1) mottles; massive; very hard, firm, very sticky and very plastic; few very fine tubular pores; few moderately thick weak red (2.5YR 4/1) clay films in fractures and pores; neutral.

Depth to bedrock is 60 inches or more. Depth to the buried soil is 30 to 40 inches.

The A horizon has hue of 10YR or 7.5Y, value of 3 or 4 when moist, and chroma of 2 or 3 when moist or dry.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 2 or less when moist or dry. It is sandy loam or loam and is 10 to 18 percent clay and 0 to 15 percent pebbles.

The C horizon has value of 6 to 8 when dry, and it has chroma of 2 or less when moist or dry. It is sandy loam or loam and is 10 to 18 percent clay and 0 to 15 percent pebbles.

The IIBt horizon has hue of 2.5Y to 7.5YR, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 1 to 3 when moist or dry. It is silty clay or clay. The horizon is 40 to 60 percent clay and 0 to 5 percent pebbles.

Josephine series

The Josephine series consists of deep, well drained soils on mountainsides and rounded ridgetops. These soils formed in moderately fine textured colluvium and residuum derived from altered sedimentary and extrusive igneous rock. Slopes are 20 to 55 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Josephine gravelly loam, 35 to 55 percent north slopes, in a forested area about 7 miles south of Selma and near the east fork of McMullin Creek; approximately 510 feet north and 100 feet east of the southwest corner of sec. 33, T. 38 S., R. 7 W.

O1—2 inches to 0; partially decomposed litter of needles and leaves.

A1—0 to 3 inches; dark brown (7.5YR 3/2) gravelly loam, brown (10YR 5/3) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many interstitial pores; 25 percent pebbles; medium acid; abrupt smooth boundary.

B1—3 to 9 inches; brown (7.5YR 4/4) gravelly loam, light yellowish brown (10YR 6/4) dry; moderate fine and very fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine tubular pores; 15 percent pebbles; slightly acid; clear smooth boundary.

B21t—9 to 16 inches; reddish brown (5YR 5/4) clay loam, pink (7.5YR 7/4) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; common very fine, fine, and medium roots; many very fine tubular pores; common moderately thick clay films; 10 percent partially weathered pebbles; slightly acid; clear smooth boundary.

B22t—16 to 32 inches; yellowish red (5YR 5/6) clay loam, pink (7.5YR 7/4) dry; moderate fine subangular blocky structure; very hard, friable, sticky and plastic; common very fine, fine, and medium roots; many very fine tubular pores; common moderately thick clay films; 10 percent partially weathered pebbles; strongly acid; clear wavy boundary.

B23t—32 to 42 inches; yellowish red (5YR 4/6) clay loam, reddish yellow (5YR 6/6) dry; moderate medium and fine subangular blocky structure; very hard, friable, sticky and plastic; many very fine tubular pores; common moderately thick clay films; 10 percent partially weathered pebbles; very strongly acid; clear wavy boundary.

B3—42 to 51 inches; yellowish red (5YR 4/6) gravelly clay loam, reddish yellow (5YR 6/6) dry; weak medium and fine subangular blocky structure; hard, friable, sticky and plastic; many very fine tubular pores; 20 percent partially weathered pebbles; very strongly acid; clear wavy boundary.

C1—51 to 59 inches; yellowish red (5YR 5/6) gravelly clay loam, reddish yellow (7.5YR 6/6) dry; massive; dark red (2.5YR 3/6) clay films in joints; common black stains; 20 percent angular saprolitic pebbles and 30 percent hard angular pebbles; very strongly acid; gradual wavy boundary.
C2r—59 inches; saprolitic siltstone; red clay films and black stains in fractures; very strongly acid.

Depth to bedrock ranges from 40 to 60 inches. The control section averages 27 to 35 percent clay and 5 to 35 percent pebbles.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 to 4 when moist and 5 or 6 when dry, and chroma of 2 to 4 when moist or dry.

The B1 horizon has hue of 10YR, 7.5YR, or 5YR, value of 6 or 7 when dry, and chroma of 4 to 6 when moist or dry.

The B2t horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 6 to 8 when dry, and chroma of 4 or 5 when moist or dry. It averages 27 to 35 percent clay and 10 to 35 percent partially weathered and unweathered pebbles.

The B3 and C horizons have hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5 when moist and 6 to 8 when dry, and chroma of 4 to 6 when moist or dry. They average 27 to 35 percent clay and 15 to 50 percent weathered pebbles.

Jumpoff series

The Jumpoff series consists of deep, moderately well drained soils on hillsides. The soils formed in colluvium weathered from tuff and volcanic breccia. Slopes are 7 to 50 percent. The mean annual precipitation is about 40 inches, and the mean annual air temperature is about 49 degrees F.

Typical pedon of Jumpoff clay loam, 35 to 50 percent south slopes, in a forested area, about 1 mile east of Jack Creek Road; approximately 630 feet north and 1,150 feet west of the southeast corner of sec. 29, T. 34 S., R. 5 W.

O1—1 inch to 0; litter of needles and twigs.
A11—0 to 3 inches; dark grayish brown (2.5Y 4/2) clay loam, light gray (2.5Y 7/2) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many interstitial pores; medium acid; clear smooth boundary.
A12—3 to 12 inches; dark grayish brown (2.5Y 4/2) clay loam, light gray (2.5Y 7/2) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and medium roots; many very fine tubular pores; medium acid; clear smooth boundary.
B1—12 to 18 inches; dark grayish brown (2.5Y 4/2) clay loam; light brownish gray (2.5Y 6/2) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; many very fine tubular pores; medium acid; gradual smooth boundary.
B2t—18 to 31 inches; light olive brown (2.5Y 5/4) clay, light gray (2.5Y 7/2) dry; strong medium subangular blocky structure; very hard, very firm, sticky and plastic; few medium and coarse roots; common very fine tubular pores; common moderately thick clay films; medium acid; gradual wavy boundary.
B3t—31 to 55 inches; brown (10YR 5/3) clay, pale brown (10YR 6/3) dry; moderate coarse prismatic structure; very hard, very firm, sticky and plastic; few very fine tubular pores; common thin clay films; medium acid; clear smooth boundary.
Cr—55 inches; highly weathered saprolite derived from tuff and volcanic breccia.

Depth to weathered bedrock ranges from 40 to 60 inches. The control section averages 0 to 15 percent pebbles and 0 to 15 percent cobbles.

The A horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 2 or 3 when moist or dry.

The B2t horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 2 to 4 when moist or dry. It is clay or cobbly clay.

Kerby series

The Kerby series consists of deep, well drained soils on stream terraces. These soils formed in alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Kerby loam, in a forested area, about one-half mile south of the town of Kerby; approximately 450 feet north and 2,425 feet east of the southwest corner of sec. 9, T. 39 S., R. 8 W.

Ap—0 to 4 inches; dark brown (7.5YR 3/2) loam, brown (7.5YR 4/3) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine interstitial pores; slightly acid; abrupt smooth boundary.
A12—4 to 7 inches; brown (7.5YR 4/4) loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; common fine interstitial pores; medium acid; clear smooth boundary.
B1—7 to 18 inches; brown (7.5YR 4/4) loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine tubular pores; medium acid; clear smooth boundary.

B21—18 to 29 inches; brown (7.5YR 4/4) loam, yellowish brown (10YR 5/6) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and very fine roots; common very fine tubular pores; 5 percent small pebbles; medium acid; gradual smooth boundary.
B22—29 to 40 inches; brown (10YR 4/3) loam, yellowish brown (10YR 5/6) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and very fine roots; common very fine tubular pores; few thin reddish brown (5YR 4/3) clay films; 5 percent pebbles; medium acid; clear wavy boundary.
IIC1—40 to 52 inches; brown (10YR 4/3) extremely gravelly sandy loam; massive; soft, very friable, nonsticky and nonplastic; many interstitial pores; 70 percent pebbles; slightly acid; gradual wavy boundary.
IIC2—52 to 60 inches; very dark grayish brown (10YR 3/2) extremely gravelly sand; massive; soft, very friable, nonsticky and nonplastic; many interstitial pores; 85 percent pebbles; slightly acid.

Depth to bedrock is 60 inches or more. The control section averages 18 to 27 percent clay.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 4 to 5 when dry, and chroma of 2 to 4 when moist or dry. It is 0 to 15 percent pebbles and cobbles.

The B horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 3 to 6 when moist or dry. It is 5 to 25 percent pebbles and cobbles.

The C horizon is 35 to 85 percent rock fragments, mainly pebbles.

Knapke series

The Knapke series consists of deep, well drained soils on mountainsides. These soils formed in colluvium weathered from olivine gabbro. Slopes are 35 to 85 percent. The mean annual precipitation is about 60 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of Knapke extremely gravelly loam in a forested area of Fantz-Knapke complex, 35 to 85 percent south slopes, about 12 miles northwest of Selma, at the end of the Illinois River Road; approximately 1,280 feet east and 800 feet north of the southwest corner of sec. 6, T. 37 S., R. 9 W.

O1—1 inch to 0; partially decomposed leaves, needles, and twigs.
A11—0 to 4 inches; very dark brown (10YR 2/2) extremely gravelly loam, black (10YR 2/1) crushed, dark brown (10YR 4/3) dry; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine pores; 60 percent pebbles, 15 percent cobbles, and 15 percent stones; slightly acid; clear smooth boundary.
A12—4 to 8 inches; very dark grayish brown (10YR 3/2) extremely gravelly loam, dark brown (10YR 4/3) dry; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots, common medium roots, and few coarse roots; many very fine and fine pores; 60 percent pebbles, 15 percent cobbles, and 5 percent stones; slightly acid; clear smooth boundary.
AC—8 to 13 inches; dark brown (10YR 3/3) extremely gravelly loam, dark yellowish brown (10YR 4/4) dry; weak very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots and few very fine and coarse roots; many very fine and fine pores; 60 percent pebbles; slightly acid; abrupt wavy boundary.
C1—13 to 26 inches; dark brown (7.5YR 3/4) extremely gravelly loam, brown (7.5YR 4/4) dry; massive; soft, friable, slightly sticky and slightly plastic; many fine and medium roots and few coarse roots; many very fine and fine pores; 80 percent pebbles and 5 percent cobbles; slightly acid; gradual wavy boundary.
C2—26 to 62 inches; dark brown (7.5YR 3/4) extremely gravelly loam, brown (7.5YR 5/4) dry; massive; soft, friable, slightly sticky and slightly plastic; common fine roots and few medium and coarse roots; many very fine and fine pores; 60 percent pebbles, 10 percent cobbles, and 5 percent stones; slightly acid.

Depth to bedrock is 60 inches or more. The control section averages 18 to 27 percent clay and 45 to 85 percent rock fragments, of which 5 to 15 percent is cobbles and stones. Rock fragments are dominantly olivine gabbro.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 1 to 3 when moist. It averages 45 to 85 percent rock fragments, of which 5 to 20 percent is cobbles and stones.

The C horizon has hue of 10YR or 7.5YR, value of 3 or 4 when moist and 4 or 5 when dry, and chroma of 3 or 4 when moist or dry.

Manita series

The Manita series consists of deep, well drained soils on fans, hillsides, and mountainsides. The soils formed in colluvium and alluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 2 to 50 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Manita loam, 20 to 35 percent slopes, in a forested area, about 3 miles southeast of Grants Pass on Greens Creek, approximately 1,720 feet south and 1,660 feet east of the northwest corner of sec. 26, T. 36 S., R. 5 W.

O1—1/2 inch to 0; duff layer.
A1—0 to 4 inches; dark reddish brown (5YR 3/4) loam, reddish brown (5YR 5/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine tubular pores; medium acid; clear smooth boundary.
A3—4 to 11 inches; dark reddish brown (5YR 3/4) loam, reddish brown (5YR 5/4) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and coarse roots; many very fine tubular pores; medium acid; clear smooth boundary.
B1—11 to 20 inches; reddish brown (5YR 4/4) clay loam, reddish brown (5YR 5/4) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; common medium and coarse roots; many very fine tubular pores; few bleached sand and silt grains; common moderately thick clay films; medium acid; clear smooth boundary.
B21t—20 to 31 inches; reddish brown (5YR 4/4) clay, yellowish red (5YR 5/6) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common very fine tubular pores; common moderately thick clay films; few black stains; medium acid; gradual smooth boundary.
B22t—31 to 44 inches; reddish brown (5YR 4/4) clay, yellowish red (5YR 5/6) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common very fine tubular pores; common moderately thick clay films; few black stains; medium acid; clear smooth boundary.
B3t—44 to 50 inches; reddish brown (5YR 4/4) clay, yellowish red (5YR 5/6) dry; massive; hard, firm, sticky and plastic; common very fine tubular pores; few moderately thick clay films in pores; common black stains; medium acid; gradual wavy boundary.
Cr—50 inches; weathered metamorphic bedrock; clay films in fractures.

Depth to weathered bedrock ranges from 40 to 60 inches.

The A horizon has hue of 5YR, 7.5YR, or 10YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 2 to 4 when moist or dry. It averages 0 to 15 percent pebbles.

The Bt horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 3 to 5 when moist and 4 to 6 when dry, and chroma of 4 to 6 when moist or dry. It is clay loam, silty clay, or clay. The Bt horizon is 35 to 45 percent clay and 0 to 15 percent pebbles.

McMullin series

The McMullin series consists of shallow, somewhat excessively drained soils on ridges and mountainsides. These soils formed in colluvium derived from altered sedimentary and extrusive igneous rock. Slopes are 30 to 60 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of McMullin gravelly loam, 30 to 60 percent slopes, in an area of rangeland, about 750 feet north of Anderson Creek Bridge on the east side of U.S. Highway 199; approximately 1,930 feet south and 1,590 feet west of the northeast corner of sec. 35, T. 37 S., R. 8 W.

A1—0 to 7 inches; dark brown (10YR 3/3) gravelly loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; 20 percent fine angular sandstone pebbles; medium acid; clear smooth boundary.
B2—7 to 14 inches; dark yellowish brown (10YR 3/4) gravelly clay loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few fine roots; few fine pores; 25 percent fine angular pebbles; medium acid; clear wavy boundary.
R—14 inches; fractured hard bedrock.

Depth to bedrock is 12 to 20 inches. The control section averages 15 to 25 percent pebbles and 0 to 15 percent cobbles.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry.

The B horizon has hue of 10YR or 7.5YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 3 or 4 when moist or dry. It is loam or clay loam and averages 20 to 35 percent clay.

Newberg series

The Newberg series consists of deep, somewhat excessively drained soils on flood plains. These soils formed in recent mixed alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Newberg fine sandy loam, in a cultivated area, about 5 miles west of Grants Pass; approximately 830 feet east and 560 feet north of the southwest corner of sec. 17, T. 36 S., R. 6 W.

Ap—0 to 6 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine roots; many very fine tubular pores; medium acid; abrupt smooth boundary.
AC—6 to 15 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; weak medium

subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine roots; many very fine tubular pores; medium acid; clear smooth boundary.

C1—15 to 24 inches; dark yellowish brown (10YR 3/4) sandy loam with 10- to 30-millimeter-thick strata of loamy sand, brown (10YR 4/3) dry; massive; soft, very friable, nonsticky and nonplastic; many interstitial pores; medium acid; clear smooth boundary.

C2—24 to 61 inches; dark yellowish brown (10YR 3/4) loamy fine sand with 10- to 30-millimeter-thick strata of dark brown (10YR 3/3) fine sandy loam, brown (10YR 4/3) dry; single grain; loose; many interstitial pores; 10 percent pebbles; slightly acid.

Depth to bedrock is 60 inches or more. The mollic epipedon is 10 to 20 inches thick. The control section is loamy fine sand, sandy loam, or fine sandy loam and averages less than 18 percent clay.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 or 3 when moist or dry. It averages 0 to 15 percent pebbles.

The C horizon has value of 3 or 4 when moist and 4 to 6 when dry, and it has chroma of 2 to 4 when moist or dry. It is fine sandy loam, sandy loam, or loamy fine sand and is 0 to 15 percent pebbles. Depth to gravel is 40 to 60 inches or more.

Pearsoll series

The Pearsoll series consists of shallow, well drained soils on mountainsides. These soils formed in colluvium weathered from serpentinite and peridotite. Slopes are 20 to 90 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of a Pearsoll extremely stony clay loam in an area of Pearsoll-Rock outcrop complex, 20 to 60 percent slopes, about one-half mile south of Waldo (an abandoned mining town) and 50 feet above the Waldo Lookout road; approximately 1,400 feet north and 600 feet west of the southeast corner of sec. 28, T. 40 S., R. 8 W.

A1—0 to 5 inches; dark reddish brown (5YR 3/3) extremely stony clay loam, reddish brown (5YR 4/4) dry; moderate fine and very fine subangular blocky structure; very hard, friable, sticky and plastic; common very fine and fine roots and few medium roots; common interstitial pores; 5 percent of surface is covered with stones; 40 percent angular pebbles and 20 percent cobbles; slightly acid; clear wavy boundary.

B2—5 to 14 inches; dark reddish brown (5YR 3/4) extremely cobbly clay, reddish brown (5YR 4/4) crushed, reddish brown (5YR 4/4) dry; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine and fine roots; common very fine and fine tubular pores; 6 percent cobbles and 15 percent pebbles; neutral; abrupt wavy boundary.

R—14 inches; fractured serpentinite.

Depth to hard bedrock is 10 to 20 inches. The control section averages 35 to 70 percent rock fragments, of which 10 to 25 percent is pebbles and 25 to 60 percent is cobbles. Stones cover 3 to 15 percent of the surface.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4 when dry, and chroma of 2 or 3 when moist and 3 or 4 when dry.

The B horizon has hue of 5YR or 2.5YR, and it has chroma of 4 to 6 when moist or dry. It is very cobbly clay or extremely cobbly clay and is 40 to 60 percent clay.

Perdin series

The Perdin series consists of moderately deep, well drained soils on mountainsides. These soils formed in colluvium weathered from serpentinite and peridotite. Slopes are 30 to 50 percent. The mean annual precipitation is about 55 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of Perdin cobbly loam, 30 to 50 percent south slopes, in a forested area, about 5 miles west of Onion Mountain Lookout; approximately 2,040 feet east and 2,600 feet north of the southwest corner of sec. 2, T. 36 S., R. 9 W.

O1—2 inches to 0; leaves, needles, and twigs overlying highly decomposed forest litter.

A1—0 to 7 inches; dark reddish brown (2.5YR 3/4) cobbly loam, reddish brown (2.5YR 4/4) dry; weak fine granular structure and moderate fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium and coarse roots; few very fine tubular pores; 10 percent pebbles and 10 percent cobbles; slightly acid; clear wavy boundary.

B21t—7 to 12 inches; dark reddish brown (5YR 3/4) gravelly clay loam, reddish brown (5YR 4/4) crushed, strong brown (7.5YR 4/6) dry; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine roots and few medium and coarse roots; common fine tubular pores; few thin clay films on peds and in tubular pores; 15 percent pebbles; neutral; clear wavy boundary.

B22t—12 to 24 inches; dark brown (7.5YR 3/4) gravelly clay loam, strong brown (7.5YR 4/6) dry; moderate fine angular blocky structure; slightly hard, friable, sticky and plastic; few roots; few fine tubular pores; few moderately thick clay films on peds and in tubular pores; 25 percent pebbles; neutral; abrupt wavy boundary.

Cr—24 inches; weathered serpentinite.

Depth to weathered bedrock is 20 to 40 inches. The control section averages 15 to 25 percent pebbles and 0 to 10 percent cobbles.

The A horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 3 or 4 when moist, and chroma of 4 to 6 when moist or dry. It averages 10 to 20 percent cobbles and 5 to 15 percent pebbles.

The Bt horizon has value of 4 or 5 when dry, and it has chroma of 4 or 5 when moist and 4 to 6 when dry. It is gravelly clay loam or gravelly clay.

Pollard series

The Pollard series consists of deep, well drained soils on high stream terraces, in saddles, and on hillsides. The soils formed in alluvium and colluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 2 to 70 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon for Pollard loam, 7 to 12 percent slopes, in a forested area, about one-half mile south of Kerby; approximately 720 feet north and 85 feet west of the southeast corner of sec. 9, T. 39 S., R. 8 W.

O1—1 inch to 0; litter of leaves, needles, and twigs.

A11—0 to 3 inches; dark brown (7.5YR 3/3) loam, brown (7.5YR 4/3) dry; strong medium and moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine and fine tubular pores and few fine interstitial pores; 10 percent pebbles; medium acid; clear smooth boundary.

A12—3 to 7 inches; reddish brown (5YR 4/4) clay loam, yellowish red (5YR 5/6) dry; moderate medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many fine and medium roots; many very fine tubular pores; 10 percent pebbles; strongly acid; clear smooth boundary.

B1—7 to 15 inches; dark red (2.5YR 3/6) clay, yellowish red (5YR 5/6) dry; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common medium and coarse roots; many very fine tubular pores and few fine tubular pores; few moderately thick clay films in pores; 10 percent pebbles; strongly acid; clear smooth boundary.

B21t—15 to 24 inches; dark red (2.5YR 3/6) clay, red (2.5YR 4/6) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common medium and coarse roots; common very fine tubular pores; common moderately thick dark red (2.5YR 3/6) clay films; 10 percent pebbles; strongly acid; gradual smooth boundary.

B22t—24 to 36 inches; red (2.5YR 4/6) clay, red (2.5YR 4/6) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine tubular pores; common moderately thick dark red (2.5YR 3/6) clay films; 15 percent pebbles; strongly acid; clear wavy boundary.

B3t—36 to 60 inches; red (2.5YR 4/6) clay loam, yellowish red (5YR 5/6) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few very fine tubular pores; few thin dark red (2.5YR 3/6) clay films; few black stains; 50 percent partially weathered pebbles, of which 15 percent is hard pebbles; strongly acid; gradual smooth boundary.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 7.5YR, 5YR, or 2.5YR, and it has chroma of 3 or 4 when moist and 3 to 6 when dry. It is 5 to 25 percent rock fragments.

The Bt horizon has hue of 2.5YR or 5YR. It has value of 4 or 5 in the upper part when dry and 5 in the lower part when dry, and it has chroma of 4 to 6 when moist and 5 or 6 when dry. It is clay, silty clay, or clay loam. The B2t horizon is 50 percent clay and 0 to 15 percent hard rock fragments. The B3t horizon is 50 percent or less hard rock fragments. Content of hard rock fragments below the control section is also 50 percent or less in some pedons.

Rogue series

The Rogue series consists of deep, somewhat excessively drained soils on mountainsides. These soils formed in colluvium weathered from granitic rock. Slopes are 35 to 70 percent. The mean annual precipitation is about 60 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of a Rogue stony coarse sandy loam in a forested area of Rogue-Goodwin complex, 35 to 70 percent north slopes, about 3 miles northeast of the Oregon Caves National Monument; approximately 1,520 feet south and 1,040 feet west of the northeast corner of sec. 12, T. 40 S., R. 6 W.

O1—1 inch to 0; partially decomposed leaves, needles, and twigs.

A1—0 to 4 inches; dark brown (10YR 3/3) stony coarse sandy loam, pale brown (10YR 6/3) dry; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many pores; 40 percent pebbles and 5 percent stones; medium acid; clear wavy boundary.

B21—4 to 17 inches; dark yellowish brown (10YR 4/4) gravelly coarse sandy loam, light yellowish brown (10YR 6/4) dry; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; few fine and medium roots and many very fine roots; many pores; 30 percent pebbles; medium acid; clear wavy boundary.

B22—17 to 30 inches; dark brown (10YR 4/3) gravelly coarse sandy loam; yellowish brown (10YR 5/4) dry; weak fine granular structure and weak very fine

subangular blocky; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many pores; 25 percent pebbles; medium acid; clear wavy boundary.

C—30 to 56 inches; dark grayish brown (2.5Y 4/2) and olive brown (2.5Y 4/4) gravelly loamy coarse sand, light yellowish brown (2.5Y 6/4) dry; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many pores; 20 percent pebbles; strongly acid; clear wavy boundary.

Cr—56 inches; grus derived from granodiorite.

Depth to weathered bedrock is 40 to 60 inches. The control section is 35 percent or less rock fragments, of which 15 to 25 percent is pebbles and 0 to 20 percent is cobbles.

The A horizon has value of 3 or 4 when moist and 4 to 6 when dry, and it has chroma of 2 to 4 when moist or dry.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 3 or 4 when moist or dry.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6 when moist and 5 to 8 when dry, and chroma of 2 to 4 when moist or dry. It is coarse sandy loam or gravelly loamy coarse sand and averages 0 to 25 percent pebbles.

Ruch series

The Ruch series consists of deep, well drained soils on foot slopes and alluvial fans. These soils formed in alluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 2 to 12 percent. The mean annual precipitation is about 30 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Ruch gravelly silt loam, 7 to 12 percent slopes, in a forested area, about 2 miles west of Murphy; approximately 1,800 feet north and 560 feet east of the southwest corner of sec. 24, T. 37 S., R. 6 W.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) gravelly silt loam, brown (10YR 5/3) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; common interstitial pores; 15 percent pebbles; neutral; abrupt smooth boundary.

A3—5 to 13 inches; dark brown (10YR 4/3) gravelly loam, yellowish brown (10YR 5/4) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; common interstitial pores; 15 percent pebbles; neutral; gradual smooth boundary.

B1—13 to 24 inches; brown (10YR 4/3) gravelly loam, yellowish brown (10YR 5/4) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine tubular pores; 15 percent pebbles; neutral; clear smooth boundary.

B21t—24 to 32 inches; dark yellowish brown (10YR 4/4) gravelly clay loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine tubular pores; few thin clay films; many coarse quartz sand grains; 25 percent pebbles and 5 percent cobbles; slightly acid; clear smooth boundary.

B22t—32 to 48 inches; brown (7.5YR 4/4) gravelly clay loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; common very fine tubular pores; common moderately thick clay films; many coarse quartz sand grains; 15 percent pebbles; neutral; clear smooth boundary.

C—48 to 60 inches; brown (7.5YR 4/4) gravelly loam, yellowish brown (10YR 5/4) dry; massive; slightly hard, firm, slightly sticky and plastic; few roots; many very fine tubular pores; few moderately thick clay films in pores; many coarse quartz sand grains; 20 percent pebbles; neutral.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 when dry, and chroma of 2 to 4 when moist or dry. It averages 15 to 30 percent pebbles.

The B2t and C horizons have value of 3 or 4 when moist, and they have chroma of 4 to 6 when moist or dry. They are loam or clay loam and are 24 to 30 percent clay. These horizons average 5 to 20 percent partially weathered pebbles and 0 to 5 percent partially weathered cobbles.

Selmac series

The Selmac series consists of deep, moderately well drained soils in drainage basins. These soils formed in stratified loamy and clayey alluvium. Slopes are 2 to 20 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 52 degrees F.

Typical pedon of Selmac loam, 2 to 7 percent slopes, in a forested area, about 7 miles west of Grants Pass; approximately 80 feet north and 1,915 feet east of the southwest corner of sec. 13, T. 36 S., R. 7 W.

A1—0 to 6 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate medium granular structure and moderate fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine vesicular and tubular pores; 15 percent pebbles; strongly acid; clear smooth boundary.

B1—6 to 10 inches; dark yellowish brown (10YR 3/4) clay loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure;

slightly hard, friable, sticky and plastic; common fine to coarse roots; many very fine tubular pores; 10 percent pebbles; strongly acid; clear wavy boundary.

B2t—10 to 18 inches; reddish brown (5YR 4/4) gravelly clay loam, brown (7.5YR 5/4) dry; moderate fine subangular blocky structure; hard, friable, sticky and plastic; common fine and medium roots; common fine tubular pores; few moderately thick dark reddish brown (5YR 3/4) clay films and common thin dark reddish brown (5YR 3/4) clay films on peds; 20 percent pebbles and 5 percent cobbles; strongly acid; abrupt wavy boundary.

IIC1—18 to 28 inches; olive brown (2.5Y 4/4) heavy clay, light brownish gray (2.5Y 6/2) dry; common fine distinct dark brown (7.5YR 4/4) mottles in fractures; massive; extremely hard, extremely firm, very sticky and very plastic; few coarse roots; few very fine tubular pores; few small black concretions; common fine to coarse slickensides; medium acid; gradual smooth boundary.

IIC2—28 to 47 inches; olive gray (5Y 5/2) heavy clay, light olive gray (5Y 6/2) dry; massive; extremely hard, extremely firm, very sticky and very plastic; few coarse roots; few fine tubular pores; common fine to coarse slickensides and few intersecting slickensides; medium acid; clear smooth boundary.

IIC3—47 to 60 inches; olive brown (2.5Y 4/4) and olive gray (5Y 4/2) clay, light olive gray (5Y 6/2) dry; massive; extremely hard, extremely firm, very sticky and very plastic; few small black stains; medium acid.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 when moist and 4 or 5 when dry, and chroma of 2 to 4 when moist and 3 or 4 when dry. It averages 5 to 15 percent pebbles.

The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 or 4 when moist and 4 or 5 when dry, and chroma of 3 or 4 when moist or dry. It is clay loam or gravelly clay loam and is 27 to 35 percent clay. This horizon averages 10 to 20 percent pebbles and 0 to 10 percent cobbles. A stone line is at the base of the solum in some pedons.

The IIC horizon has hue of 2.5Y or 5Y, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 2 to 4 when moist or dry. It is 55 to 70 percent clay.

Siskiyou series

The Siskiyou series consists of moderately deep, somewhat excessively drained soils on hillsides and mountainsides. These soils formed in colluvium or residuum derived from granodiorite, quartz-diorite, or granite. Slopes are 20 to 70 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of Siskiyou gravelly sandy loam, 35 to 60 percent south slopes, in a forested area, about 750 feet north and 1,060 feet west of the southeast corner of sec. 36, T. 35 S., R. 6 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; many interstitial pores; 20 percent small pebbles; slightly acid; clear wavy boundary.

B1—4 to 11 inches; dark brown (10YR 4/3) sandy loam, very pale brown (10YR 7/3) dry; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; common interstitial pores; 15 percent small pebbles; medium acid; clear wavy boundary.

B2—11 to 19 inches; dark yellowish brown (10YR 4/4) sandy loam, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; hard, friable, nonsticky and nonplastic; few very fine and fine roots; common interstitial pores; 15 percent small pebbles; medium acid; clear wavy boundary.

C1—19 to 31 inches; yellowish brown (10YR 5/4) sandy loam, light gray (10YR 7/2) dry; massive; hard, friable, nonsticky and nonplastic; few roots; common interstitial pores; 15 percent pebbles; medium acid; clear wavy boundary.

C2—31 to 36 inches; yellowish brown (10YR 5/4) sandy loam, light gray (10YR 7/2) and white (10YR 8/2) dry; massive; slightly hard, friable, nonsticky and nonplastic; few roots; common interstitial pores; strongly acid; gradual wavy boundary.

C3r—36 inches; weathered granodiorite; dark brown (7.5YR 4/4) stains in fractures.

Depth to weathered bedrock ranges from 20 to 40 inches. The control section averages 8 to 12 percent clay.

The A horizon has value of 4 to 6 when dry and chroma of 2 or 3 when moist or dry. It averages 10 to 25 percent pebbles.

The B horizon has hue of 10YR, 7.5YR, or 2.5Y, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 2 to 4 when moist or dry. It is coarse sandy loam or sandy loam.

The C2 horizon has value of 5 or 6 when moist and 7 or 8 when dry, and it has chroma of 2 to 4 when moist or dry. It is sandy loam or coarse sandy loam. This horizon averages 10 to 25 percent pebbles and 0 to 10 percent cobbles. The total content of rock fragments in the B and C horizons is 35 percent or less.

Speaker series

The Speaker series consists of moderately deep, well drained soils on mountainsides. These soils formed in colluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 35 to 55 percent. The

mean annual precipitation is about 45 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of a Speaker gravelly loam in a forested area of Speaker-Josephine gravelly loams, 35 to 55 percent south slopes, on Daisy Mountain Road, about 2.5 miles southeast of Placer and 1.5 miles east of the intersection of north-south powerline road and Daisy Mountain Road; approximately 100 feet west and 1,620 feet south of the northeast corner of sec. 21, T. 34 S., R. 5 W.

A11—0 to 3 inches; dark brown (7.5YR 3/3) gravelly loam, brown (7.5YR 5/3) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many interstitial pores; 30 percent hard pebbles and cobbles; slightly acid; abrupt smooth boundary.

A12—3 to 6 inches; dark brown (7.5YR 3/4) gravelly loam, brown (7.5YR 5/4) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; many very fine and fine tubular pores; 20 percent hard pebbles and cobbles; medium acid; clear smooth boundary.

B1—6 to 13 inches; reddish brown (5YR 4/4) gravelly loam, reddish brown (5YR 5/4) dry; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine roots and common medium roots; many very fine and fine tubular pores; 20 percent hard pebbles; medium acid; clear smooth boundary.

IIB2t—13 to 30 inches; yellowish red (5YR 4/6) gravelly clay loam, yellowish red (5YR 5/6) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; common medium and coarse roots; common very fine and fine tubular pores; few moderately thick clay films; 20 percent weathered pebbles; medium acid; gradual wavy boundary.

IICr—30 inches; weathered bedrock; common dark red (2.5YR 3/6) clay films and black stains in fractures.

Depth to weathered bedrock is 20 to 40 inches. The control section averages 25 to 35 percent clay. It is 35 percent or less rock fragments, of which 0 to 30 percent is pebbles and 0 to 15 percent is cobbles.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 3 to 6 when moist or dry. It averages 15 to 30 percent pebbles and 0 to 5 percent cobbles.

The Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5 when moist and 4 to 7 when dry, and chroma of 4 to 6 when moist or dry. It is gravelly clay loam, gravelly loam, or loam. Moderately thick clay films are few to common in this horizon.

Takilma series

The Takilma series consists of deep, well drained soils on low stream terraces. These soils formed in cobbly and gravelly alluvium. Slopes are 0 to 3 percent. The mean annual precipitation is 45 inches, and the mean annual air temperature is 52 degrees F.

Typical pedon of Takilma cobbly loam, in a cultivated area, about one-fourth mile north of Takilma store and 200 feet west of Takilma-Bridgeview Road; approximately 1,030 feet north and 820 feet east of the southwest corner of sec. 26, T. 40 S., R. 8 W.

A1—0 to 6 inches; dark brown (7.5YR 3/2) cobbly loam, brown (7.5YR 5/3) dry; moderate fine subangular blocky stucture and moderate very fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many interstitial pores; 20 percent cobbles and 15 percent pebbles; slightly acid; clear smooth boundary.

B2—6 to 18 inches; dark brown (7.5YR 3/3) very cobbly loam, brown (7.5YR 5/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and fine roots; many interstitial pores; 25 percent pebbles and 25 percent cobbles; slightly acid; clear smooth boundary.

C—18 to 60 inches; dark brown (7.5YR 4/3) extremely cobbly sandy loam, brown (7.5YR 5/3) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; few medium roots; many interstitial pores; 35 percent cobbles and 45 percent pebbles; neutral.

Depth to the very cobbly C horizon is 12 to 20 inches, and depth to bedrock is 60 inches or more. The control section averages 12 to 18 percent clay, 30 to 45 percent pebbles, and 25 to 45 percent cobbles.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist and 2 to 4 when dry. It averages 25 to 35 percent rock fragments, of which 10 to 20 percent is pebbles and 15 to 25 percent is cobbles.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry, and chroma of 2 or 3 when moist and 3 or 4 when dry. It is loam or clay loam. This horizon, on the average, is 15 to 30 percent cobbles and 20 to 30 percent pebbles.

The C horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 5 or 6 when dry, and chroma of 3 or 4 when moist or dry. It is sandy loam or loam and commonly is stratified below a depth of 40 inches. This horizon, on the average, is 30 to 50 percent pebbles.

Takilma Variant

The Takilma Variant consists of deep, well drained soils on low stream terraces. These soils formed in alluvium that weathered predominantly from serpentinite and peridotite. Slopes are 0 to 3 percent. The mean annual precipitation is 55 inches, and the mean annual air temperature is 51 degrees F.

Typical pedon of Takilma Variant extremely cobbly loam, 0 to 3 percent slopes, in an area of mixed conifers

about 1.25 miles north of O'Brien; approximately 2,100 feet west and 1,450 feet north of the southeast corner of sec. 13, T. 40 S., R. 9 W.

A1—0 to 5 inches; strong brown (7.5YR 4/6) extremely cobbly loam, strong brown (7.5YR 5/6) dry; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores; 35 percent pebbles and 35 percent cobbles; slightly acid; abrupt smooth boundary.

B2—5 to 18 inches; yellowish red (5YR 4/6) extremely cobbly loam, strong brown (7.5YR 5/6) dry; weak very fine subangular blocky structure; slightly hard, very friable, slightly sticky and plastic; common very fine roots and few fine roots; many very fine interstitial pores; 40 percent pebbles and 35 percent cobbles; slightly acid; clear wavy boundary.

C—18 to 28 inches; brown (7.5YR 4/4) extremely cobbly sandy clay loam, yellowish brown (10YR 5/6) dry; massive; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine and fine interstitial pores; 40 percent pebbles and 35 percent cobbles; neutral; clear irregular boundary.

IIC1—28 to 35 inches; strong brown (7.5YR 4/4 and 4/6) extremely cobbly loamy coarse sand, yellowish brown (10YR 5/6) dry; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many fine and medium interstitial pores; 40 percent pebbles and 40 percent cobbles; neutral; clear irregular boundary.

IIC2—35 to 63 inches; dark brown (7.5YR 3/4 and 10YR 4/4) extremely cobbly loamy coarse sand, yellowish brown (10YR 5/4 and 5/6) dry; massive; soft, very friable, nonsticky and nonplastic; few very fine and fine roots; many fine and medium interstitial pores; 25 percent pebbles, 45 percent cobbles, and 15 percent stones; neutral.

Depth to bedrock is 60 inches or more.

The A horizon has hue of 5YR and 7.5YR, value of 3 or 4 when moist, and chroma of 4 to 6 when moist. It is 60 to 85 percent rock fragments, of which 35 to 45 percent is pebbles, 25 to 35 percent is cobbles, and 0 to 10 percent is stones. This horizon, on the average, is 18 to 25 percent clay.

The B horizon has hue of 5YR and 7.5YR, and it has chroma of 4 to 6 when moist. It is 60 to 85 percent rock fragments, of which 35 to 45 percent is pebbles, 25 to 35 percent is cobbles, and 0 to 5 percent is stones. This horizon is extremely cobbly loam or extremely cobbly sandy loam, and it averages 18 to 25 percent clay.

The C horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist, and chroma of 3 to 6 when moist. It is 60 to 85 percent rock fragments, of which 35 to 45 percent is pebbles, 25 to 35 percent is cobbles, and 0 to 5 percent is stones. This horizon, on the average, is 20 to 25 percent clay.

The IIC horizon has value of 3 or 4 and chroma of 3 to 6 when moist. It is 60 to 90 percent rock fragments, of which 25 to 40 percent is pebbles, 30 to 45 percent is cobbles, and 0 to 15 percent is stones. It is extremely cobbly loamy coarse sand or extremely cobbly sand.

Tethrick series

The Tethrick series consists of deep, well drained soils on mountainsides. These soils formed in colluvium weathered from quartz-diorite or gabbro. Slopes are 45 to 70 percent. The mean annual precipitation is 50 inches, and the mean annual air temperature is 48 degrees F.

Typical pedon of Tethrick gravelly fine sandy loam, 45 to 70 percent north slopes, in a forested area about 1,940 feet north and 380 feet west of the southeast corner of sec. 21, T. 39 S., R. 5 W.

O1—1/2 inch to 0; fir needles, leaves, twigs, and bark.

A11—0 to 4 inches; very dark grayish brown (2.5Y 3/2) gravelly fine sandy loam, light brownish gray (2.5Y 6/2) dry; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots; many pores; 20 percent fine pebbles; slightly acid; clear smooth boundary.

A12—4 to 9 inches; very dark grayish brown (2.5Y 3/2) gravelly fine sandy loam, light brownish gray (2.5Y 6/2) dry; moderate fine granular structure and moderate fine subangular blocky; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots; many pores; 15 percent pebbles; slightly acid; clear smooth boundary.

B1—9 to 15 inches; dark grayish brown (2.5Y 4/2) fine sandy loam, light brownish gray (2.5Y 6/2) dry; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common fine roots; common fine and very fine tubular pores; 10 percent fine pebbles; slightly acid; clear smooth boundary.

B2—15 to 30 inches; dark grayish brown (2.5Y 4/2) fine sandy loam, light brownish gray (2.5Y 6/2) dry; weak coarse subangular blocky structure; hard, friable, slightly sticky and nonplastic; few fine and medium roots; common very fine tubular pores; 5 percent fine weathered rock fragments; slightly acid; gradual wavy boundary.

C1—30 to 53 inches; olive (5Y 4/3) fine sandy loam, light brownish gray (2.5Y 6/2) dry; massive; hard, friable, slightly sticky and nonplastic; common very fine tubular pores; 5 percent fine weathered rock fragments; slightly acid; gradual wavy boundary.

C2r—53 inches; grus derived from quartz-diorite or gabbro.

Depth to weathered bedrock ranges from 40 to 60 inches. The control section averages 5 to 18 percent clay and more than 15 percent material coarser than very fine sand. It averages 5 to 15 percent pebbles and 0 to 5 percent cobbles.

The A horizon has hue of 2.5Y or 10YR, value of 3 or 4 when moist, and chroma of 2 or 3 when moist or dry. It averages 10 to 25 percent gravel and 0 to 15 percent cobbles.

The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 2 or 3 when moist or dry. It is fine sandy loam, sandy loam, or loam.

The C horizon has hue of 2.5Y or 5Y, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 2 or 3 when moist or dry. It is fine sandy loam, sandy loam, or loam.

Vannoy series

The Vannoy series consists of moderately deep, well drained soils on mountainsides. These soils formed in colluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 20 to 55 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of a Vannoy silt loam in a forested area of Vannoy-Voorhies complex, 35 to 55 percent south slopes, about 2 miles northeast of Grants Pass; approximately 1,140 feet east and 1,680 feet south of the northwest corner of sec. 33, T. 35 S., R. 5 W.

A11—0 to 5 inches; dark brown (10YR 3/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many interstitial pores; 10 percent pebbles; slightly acid; clear smooth boundary.

A12—5 to 14 inches; dark brown (7.5YR 4/3) loam, light yellowish brown (10YR 6/4) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many very fine tubular pores; 10 percent pebbles; slightly acid; clear smooth boundary.

B1—14 to 19 inches; brown (7.5YR 4/4) clay loam, light brown (7.5YR 6/4) dry; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common medium roots and few coarse roots; many very fine tubular pores; 10 percent pebbles; slightly acid; clear smooth boundary.

B2t—19 to 33 inches; yellowish red (5YR 4/6) clay loam, yellowish red (5YR 5/6) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common medium roots and few coarse roots; many very fine tubular pores; common moderately thick red (2.5YR 4/6) clay films; common black stains; 10 percent pebbles; medium acid; clear wavy boundary.

Cr—33 inches; weathered and highly fractured metamorphic bedrock.

Depth to weathered bedrock is 20 to 40 inches. The control section averages 5 to 35 percent rock fragments that are mostly weathered and can be crushed.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 5 to 7 when dry, and chroma of 2 to 4 when moist and 3 or 4 when dry. It averages 5 to 15 percent pebbles that are mostly unweathered.

The B2t horizon has value of 4 or 5 when moist and 5 or 6 when dry, and it has chroma of 4 to 6 when moist or dry. It is clay loam that is 27 to 35 percent clay and is more than 15 percent material coarser than very fine sand. This horizon averages 5 to 30 percent weathered pebbles and 0 to 5 percent weathered cobbles.

Vermisa series

The Vermisa series consists of shallow, somewhat excessively drained soils on mountainsides. These soils formed in colluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 60 to 100 percent. The mean annual precipitation is about 45 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of a Vermisa extremely gravelly loam in a forested area of Vermisa-Beekman complex, 60 to 100 percent south slopes, about 1.5 miles northwest of Graves Creek Bridge; approximately 1,840 feet west and 800 feet north of the southeast corner of sec. 35, T. 33 S., R. 8 W.

A1—0 to 3 inches; dark yellowish brown (10YR 3/4) extremely gravelly loam, yellowish brown (10YR 5/4) dry; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many pores; 60 percent pebbles and 15 percent cobbles; slightly acid; clear smooth boundary.

B2—3 to 15 inches; strong brown (7.5YR 4/6) very gravelly loam; light brown (7.5YR 6/5) dry; weak very fine granular structure and weak very fine subangular blocky; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many pores; 45 percent pebbles and 15 percent cobbles; medium acid; abrupt irregular boundary.

R—15 inches; fractured metavolcanic bedrock.

Depth to hard, slightly fractured bedrock is 10 to 20 inches. The profile averages 35 to 55 percent pebbles and 15 to 25 percent cobbles. It has hue of 10YR or 7.5YR.

The A horizon has value of 3 to 5 when moist and 5 to 7 when dry, and it has chroma of 2 to 4 when moist or dry.

The B horizon has value of 4 or 5 when moist and 6 or 7 when dry, and it has chroma of 4 to 6 when moist and 3 to 6 when dry. It is loam or silt loam. This horizon is 18 to 27 percent clay, 35 to 55 percent pebbles, and 15 to 25 percent cobbles.

Voorhies series

The Voorhies series consists of moderately deep, well drained soils on mountainsides. These soils formed in colluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 35 to 55 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 50 degrees F.

Typical pedon of a Voorhies very gravelly loam in a forested area of Vannoy-Voorhies complex, 35 to 55 percent south slopes, about 4 miles south of Savage Rapids Dam; approximately 1,720 feet south and 40 feet east of the northwest corner of sec. 13, T. 37 S., R. 5 W.

A11—0 to 8 inches; very dark grayish brown (10YR 3/2) very gravelly loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine and fine roots; many interstitial pores; 55 percent pebbles; neutral; gradual smooth boundary.

A12—8 to 15 inches; dark grayish brown (10YR 4/2) very gravelly loam, pale brown (10YR 6/3) dry; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine and fine roots; many interstitial pores; 55 percent pebbles; neutral; clear smooth boundary.

B1—15 to 22 inches; dark grayish brown (10YR 4/2) very cobbly loam, pale brown (10YR 6/3) dry, weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many interstitial pores; 35 percent cobbles and 20 percent pebbles; slightly acid; abrupt wavy boundary.

B2t—22 to 36 inches; dark yellowish brown (10YR 4/4) very gravelly clay loam, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few medium roots; many very fine tubular pores; few moderately thick clay films; 45 percent pebbles; slightly acid; clear smooth boundary.

Cr—36 inches; fractured metamorphic bedrock.

Depth to weathered bedrock is 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 2 to 4 when moist. It is 35 to 60 percent hard angular pebbles.

The B horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5 when moist, and chroma of 3 to 5 when moist or dry. It is 35 percent or less rock fragments, of which 20 to 50 percent is hard angular pebbles and 0 to 25 percent is hard angular cobbles. This horizon is clay loam or loam and is 25 to 35 percent clay.

Wapato series

The Wapato series consists of deep, poorly drained soils on bottom lands and in basinlike areas. These soils formed in recent alluvium. Slopes are 0 to 2 percent. The mean annual precipitation is about 35 inches, and the mean annual air temperature is about 53 degrees F.

Typical pedon of Wapato silt loam, in a cultivated area, about 5 miles west of Grants Pass; approximately 810 feet east and 1,500 feet north of the southwest corner of sec. 17, T. 36 S., R. 6 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine pores; slightly acid; clear smooth boundary.

A12—8 to 17 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; common fine distinct dark reddish brown (5YR 3/3) mottles; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots; common fine pores; slightly acid; gradual smooth boundary.

B21g—17 to 24 inches; dark gray (10YR 4/1) silty clay loam, grayish brown (10YR 5/2) dry; many fine distinct dark reddish brown (5YR 3/3) mottles; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; many fine and medium pores; medium acid; clear smooth boundary.

B22g—24 to 42 inches; dark grayish brown (10YR 4/2) silty clay loam, grayish brown (10YR 5/2) dry; many fine distinct reddish brown (5YR 4/4) mottles; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few fine pores; medium acid; clear smooth boundary.

B3g—42 to 60 inches; grayish brown (10YR 5/2) silty clay, light brownish gray (10YR 6/2) dry; many fine distinct dark brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; hard, firm, very sticky and plastic; few very fine pores; medium acid.

Depth to bedrock is 60 inches or more. A seasonal water table at a depth of less than 30 inches limits rooting depth in some places. The profile is saturated with water during winter and spring unless the soils are artifically drained. The particle-size control section averages 27 to 35 percent clay. The mollic epipedon is 10 to 24 inches thick.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 when moist and 2 or 3 when dry. Distinct mottles are throughout the A horizon in some pedons, and in other pedons they are only in the lower part.

The B2 horizon has hue of 5Y to 10YR, value of 4 or 5 when moist and 5 or 6 when dry, and chroma of 1 or 2 when moist or dry. It has distinct to prominent mottles. It is mainly silty clay loam, but it ranges to silty clay below a depth of 30 inches in some pedons.

The B3 horizon, where present, commonly is silty clay.

Witzel series

The Witzel series consists of shallow, well drained soils on mountainsides. These soils formed in colluvium and residuum derived from altered sedimentary and extrusive igneous rock. Slopes are 30 to 75 percent. The mean annual precipitation is about 40 inches, and the mean annual air temperature is about 51 degrees F.

Typical pedon of a Witzel very cobbly loam in a forested area of Witzel-Rock outcrop complex, 30 to 75 percent slopes, about 4 miles east of Winona; approximately 810 feet east and 2,100 feet north of the southwest corner of sec. 1, T. 35 S., R. 5 W.

A1—0 to 7 inches; dark brown (7.5YR 3/3) very cobbly loam, brown (7.5YR 5/3) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; common interstitial pores; 30 percent cobbles and 20 percent pebbles; neutral; clear wavy boundary.

B2—7 to 14 inches; dark reddish brown (5YR 3/4) extremely cobbly clay loam, brown (7.5YR 5/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common very fine tubular pores; 40 percent hard pebbles and 30 percent hard cobbles; neutral; abrupt wavy boundary.

R—14 inches; partially weathered, fractured bedrock.

Depth to bedrock is 12 to 20 inches. The control section averages 35 to 70 percent rock fragments and 27 to 35 percent clay.

The A horizon has hue of 7.5YR or 5YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist and 2 to 4 when dry. It averages 35 to 60 percent rock fragments.

The B horizon has hue of 7.5YR or 5YR, value of 4 or 5 when dry, and chroma of 2 to 4 when moist and 3 or 4 when dry.

The Witzel soil in map unit 84F is a taxadjunct to the Witzel series because it is neutral and thus is slightly outside the reaction range defined for the Witzel series. This difference, however, does not significantly affect use and management.

Woodseye series

The Woodseye series consists of shallow, well drained soils on mountainsides. These soils formed in colluvium weathered from altered sedimentary and extrusive igneous rock. Slopes are 20 to 90 percent. The mean annual precipitation is about 55 inches, and the mean annual air temperature is about 43 degrees F.

Typical pedon of a Woodseye very gravelly loam in an area of Woodseye-Rock outcrop complex, 20 to 60 percent slopes, in a brush field about 8 miles east of Wolf Creek; approximately 2,800 feet west and 2,640 feet north of the southeast corner of sec. 13, T. 33 S., R. 5 W.

O1—2 inches to 0; partially decomposed leaves and needles.

A1—0 to 3 inches; very dark brown (10YR 2/2) very gravelly loam, grayish brown (10YR 5/2) dry; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine pores; 50 percent pebbles and 5 percent cobbles; medium acid; clear wavy boundary.

A3—3 to 8 inches; very dark brown (10YR 2/2) very gravelly loam, dark grayish brown (10YR 4/2) dry; medium very fine subangular blocky structure and medium very fine granular; soft, very friable, slightly sticky and slightly plastic; many very fine roots and few fine and medium roots; many very fine pores; 40 percent pebbles and 5 percent cobbles; medium acid; clear wavy boundary.

B1—8 to 11 inches; dark brown (7.5YR 3/2) very cobbly loam, brown (10YR 5/3) dry; medium very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine pores; 30 percent pebbles and 20 percent cobbles; medium acid; clear wavy boundary.

B2—11 to 18 inches; dark brown (7.5YR 4/4) extremely stony loam, yellowish brown (10YR 5/4) dry; medium very fine and fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots and few fine roots; many very fine pores; 10 percent pebbles, 20 percent cobbles, and 45 percent stones; strongly acid.

R—18 inches; fractured metavolcanic bedrock.

Depth to bedrock is 10 to 20 inches. The control section averages 35 to 80 percent rock fragments and 18 to 27 percent clay.

The A horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3 when moist or dry.

The B horizon has value of 3 to 5 when moist and 4 or 5 when dry, and it has chroma of 2 to 4 when moist and 3 or 4 when dry.

formation of the soils

Soil is the collection of natural bodies on the earth's surface that contains living matter and is capable of supporting plants (*12*). The nature of a soil depends upon the combination and interaction of five factors: 1) climate, 2) plant and animal life, 3) parent material, 4) topography, and 5) time.

The relative influence of each factor varies from place to place, and in some places a single factor can determine most properties of the soil. Parent material, climate, and topography are responsible for most differences in the soils in the survey area.

In this section the soil-forming factors of climate and plant and animal life are discussed separately. The factors of time, parent material, and topography are grouped together and discussed under the heading "Geomorphology."

climate

Climate, particularly the features of moisture and temperature, greatly influences soil formation. The chemical and physical reactions taking place in the soil are largely controlled by climate. Water dissolves soluble material in the soil, and it transports material from one part of the soil to another. Water is necessary for the growth of plants and soil organisms that contribute organic matter to the soil. Temperature affects the rate of chemical reactions and of physical breakdown caused by the freezing of water. Freezing and thawing of water cause expansion and contraction and influence the movement of soil particles and rock fragments in the soil. The kind and amount of living organisms in and on the soil determine the kind and amount of organic matter added to the soil, and the rate of decomposition of the organic matter is controlled by temperature and moisture.

In the survey area there are four major moisture and temperature zones that greatly influence soil genesis: 1) areas that receive less than 35 inches of precipitation and have hot, dry summers and cool, moist winters, and areas that receive more than 35 inches of precipitation and have 2) hot, dry summers and cool, moist winters, 3) warm, dry summers and cold, moist winters, and 4) cool, dry summers and cold, moist winters (fig. 14).

On many young landforms, such as low terraces and flood plains, the accumulation of organic matter has produced Xerolls and Aquolls. The Central Point, Evans, Newberg, and Takilma soils are examples of Xerolls. The Copsey, Cove, and Wapato soils are examples of Aquolls. On young landforms in areas where less organic matter has accumulated, Ochrepts and Aquepts have formed. Brockman and Kerby soils are Ochrepts, and Clawson and Jerome soils are Aquepts. The soils that formed on these young landforms are in moisture and temperature zones 1 and 2.

On some of the older landforms, such as high terraces and toe slopes, where soil forming factors have been active long enough to produce an argillic horizon, Xeralfs have formed. Abegg, Holland, Manita, Ruch, and Selmac soils are examples of Xeralfs. Xerults, such as the Pollard soils, formed on similar landforms. Xerults have been leached of bases and formed under higher annual precipitation. Where the accumulation of organic matter and the translocation of clay have been significant, Argixerolls, such as the Foehlin soils, have formed.

Annual precipitation is less than 35 inches in the mountains and hills in the east-central part of the county. This area is in moisture and temperature zone 1. Summers are hot and dry, and growing seasons are long. Winters are cool and moist, and most of the precipitation is rainfall. Under these conditions Xeralfs, such as the Vannoy, Voorhies, and Manita soils, and Ochrepts, such as the Siskiyou soils, formed. This area is the driest and the warmest of the upland vegetative zones in the county. It has contrasting plant communities that are adapted to the various combinations of soil and topography. The primary plant communities are Douglas-fir on north-facing slopes and pine and fir on south-facing slopes.

The mountains and hills in the area that receive more than 35 inches of precipitation are in three moisture and temperature zones that affect soil formation. The soils at elevations below 3,600 feet are in moisture and temperature zone 2. In this zone summers are hot and dry, and the growing season is long. Winters are cool and moist, and precipitation is mostly rainfall. The soil temperature regime is mesic. Rapid leaching of bases and illuviation of clay have contributed to the formation of Ochrepts, Xerults, and Xeralfs intergrading to Xerults. The Beekman, Colestine, Josephine, Pollard, and Speaker soils formed under these conditions. The composition of forests in this zone is more uniform than that in zone 1. Dense stands of Douglas-fir and tanoak are on north-facing slopes, and Douglas-fir, sugar pine, and ponderosa pine are on south-facing slopes.

The soils at elevations of 3,600 to 5,500 feet are in moisture and temperature zone 3. In this zone summers

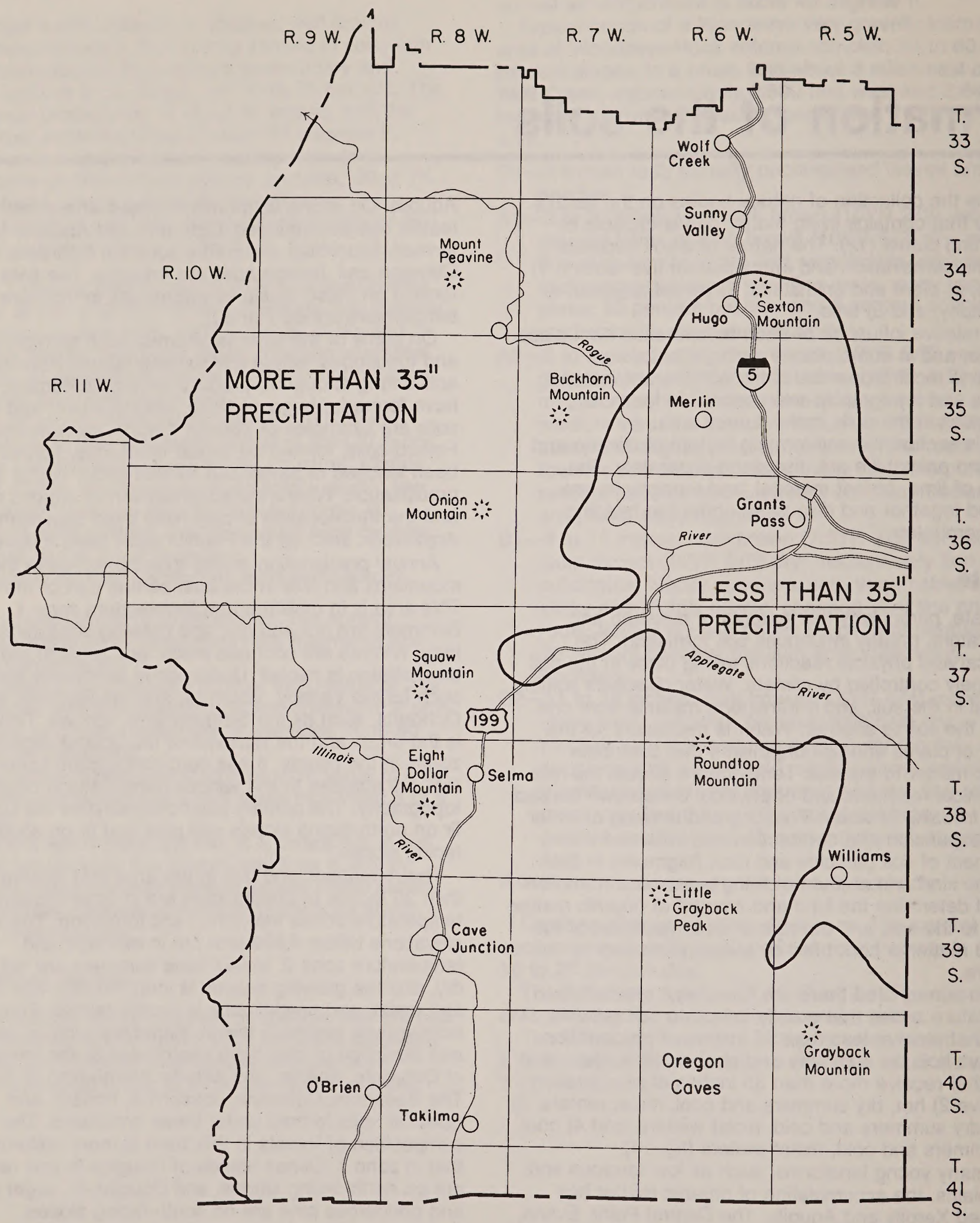


Figure 14.—Map of Josephine County showing areas that receive more than 35 inches of precipitation annually and areas that receive less than 35 inches.

are warm and dry, and the growing season is short. Winters are cold and moist, and precipitation is mostly rainfall; however, much snow accumulates at times. The soil temperature regime is frigid. Leaching of bases and the accumulation of organic matter have contributed to the formation of Umbrepts and Ochrepts, which mostly have low base saturation. Althouse, Goodwin, Jayar, and Rogue soils are examples of these soils. Dense stands of Douglas-fir, white fir, and Shasta red fir with sparse understory vegetation are on most of the soils in this zone. As elevation increases, Douglas-fir decreases.

The soils at elevations of 5,500 feet to more than 7,000 feet are in moisture and temperature zone 4. In this zone summers are cool, and the growing season is very short. Winters are cold and moist and are characterized by much snowfall. The soil temperature regime is cryic. These soils produce enough vegetation that the accumulation of organic matter is adequate for the development of an umbric epipedon. Umbrepts, such as the Bigelow and Crannler soils, formed in this zone. Vegetation is primarily white fir, mountain hemlock, and Shasta red fir with a variety of understory plants. Cold temperatures in this zone restrict decomposition of organic material.

Irrigating a soil when it is normally dry has the effect of placing the soil in a different moisture and temperature zone. Draining by tile drains or ditches counteracts the effects of relief and climate, thereby changing the relationship of the soil-forming factors. Applying amendments and chemicals affects the chemical composition of the soil and the plant and animal life.

plant and animal life

The kind and number of living organisms, especially plants, growing in or on the soil are active factors in soil formation. Conversely, the kind and number of organisms are influenced by the parent material, climate, topography, and the age of the soil. In this survey area, the effects of parent material on vegetation are greater than those of climate (*15*).

One of the most important roles of plants and animals in soil formation is the differentiation of horizons in the soil profile. Organisms also enhance important processes, such as organic matter accumulation, profile mixing, nutrient cycling, stabilization of soil structure, and addition of nitrogen.

The soils in Josephine County formed under a variety of vegetative types. Because of the complex climatic and geologic patterns in this area, it has a greater diversity of forest communities in a more complex vegetative pattern than any comparable area of the west. The number of plant species is high. Many are endemic, and several of these are relict species that formerly were more widely distributed.

The vegetation on the flood plains is mainly deciduous trees, shrubs, and grasses, which contribute a large amount of organic material to the soil. The roots of deciduous trees and shrubs take up calcium and other bases and return them to the soil annually through leaves and twigs, thus reducing the base loss by leaching. The annual dieback of roots returns large amounts of organic matter to the soils. Mollisols, such as Evans and Newberg soils, formed under these conditions, although Mollisols are not confined to the flood plains.

The vegetation on stream terraces is mainly conifers, deciduous trees, and shrubs. The proportions of coniferous and deciduous species vary with annual precipitation. In the moisture and precipitation zone that receives less than 35 inches of precipitation annually, plants provide much organic matter because the proportion of deciduous trees and shrubs to conifers is high. Coniferous trees absorb bases from the soil, and the bases are not readily recycled. Soils that formed under these conditions are the Manita soils, which are Mollic Haploxeralfs. Soils that generally do not support trees are the Foehlin and Takilma soils. These are Mollisols that formed under grasses and shrubs.

In the moisture and precipitation zones that receive more than 35 inches of precipitation, the proportion of deciduous trees and shrubs to conifers is low. Organic matter has accumulated; however, the bases are absorbed by the conifers and are not readily returned to the soil. The greater precipitation in these zones also removes bases through leaching. Soils that formed in these climatic zones are Ultisols, Alfisols intergrading to Ultisols, and Inceptisols. Examples of these are Pollard, Abegg, and Kerby soils, respectively.

In the mountains and hills that receive less than 35 inches of precipitation, organic matter accumulates mainly from deciduous trees and shrubs. Nutrient cycling and limited precipitation have resulted in the formation of Alfisols with a fairly high base saturation, such as the Vannoy and Voorhies soils. In the uplands that receive more than 35 inches of precipitation, the proportion of deciduous trees and shrubs to conifers is very low. The decreased nutrient cycling and increased precipitation in these areas have promoted the formation of Ultisols and of Alfisols and Inceptisols with low base saturation. The Josephine, Speaker, and Tethrick soils, respectively, are examples.

In the mountains that receive more than 35 inches of precipitation, and where the soil temperature regimes are frigid and cryic, the vegetation is mainly conifers and evergreen shrubs. Organic matter has accumulated, but nutrient cycling has been minimal. The high precipitation in this zone has leached bases, and an umbric epipedon has formed in many soils. Umbrepts, such as the Goodwin soils, formed in this setting.

In addition to the influence of landscape position and climate, parent material also strongly influences the vegetation. Plants growing on soils derived from ultramafic rock such as serpentintite and peridotite contrast strongly with those on other soils. The fertility of these soils is quite low. Trees are sparse, while shrubs

and grasses are fairly abundant. The lack of an adequate amount of calcium and the overabundance of magnesium in the soils are probably the main reasons for limited plant growth and low activity of organisms in the soils. Xeralfs and Ochrepts such as the Dubakella and Eightlar soils formed under conditions of limited accumulation of organic material and limited seasonal precipitation.

Organisms in the soil, such as earthworms, rodents, insects, and micro-organisms, are especially important in the early stages of organic matter decomposition. They add and mix organic matter, accelerate its decomposition, perform transformations on nutrient elements to complete nutrient cycles, influence soil acidity, increase soil aeration, and improve soil drainage.

geomorphology

The Klamath Mountains in the survey area consist of a complex area of steep, rugged terrain. They are flanked on three sides by other mountain ranges, all of which are made up of younger rock. The rock that makes up the Klamath Mountains began forming in the Paleozoic. Sediment, including limestone-forming material and volcanic material, was deposited on the floors of inland seas. Late in this period the rock that had formed was metamorphosed, folded, and faulted, and then it was uplifted into mountains. This geologic formation is now called the Applegate Group. These mountains were eroded, and then much of the area was again submerged during the Triassic and Jurassic. Additional sediment and volcanic material was deposited in this period.

In the late Jurassic, extensive deformation and intrusion occurred, accompanied by another uplift. The Galice and Rogue Formations developed in this period. Also at this time were Nevadan intrusions of gabbro, diorite, and granite. Ultramafic rock such as peridotite and serpentinite formed (crystallized) much earlier than the granitic rock. Its origin was probably in the earth's upper mantle, and it has been injected into the earth's crust tectonically; however, the date when this occurred has not been firmly established. A long cycle of erosion followed, and at the close of the Cretaceous the mountains were again uplifted. Throughout the Cenozoic the mountains were uplifted, folded, faulted, and eroded. This complex arrangement of rock types provides a diverse array of parent material.

Late in the Pliocene the climate became much cooler, and glaciers formed at the higher elevations in the southeastern part of the area. The glaciers were small, and they were located on the relatively protected north- and east-facing slopes (*5*). Much material was eroded by the glaciers and then deposited downslope. During the middle Pleistocene and Holocene, the glaciers receded and then disappeared. Alluvium was scoured from older formations, transported by water, and deposited to form the older of the present geomorphic surfaces.

The geomorphic surfaces in Josephine County closely correspond to those surfaces studied and mapped in Jackson County, Oregon (*8*). These geomorphic surfaces fit a time sequence. This time sequence is related to soil development associated with the sequence of surfaces. The soil classification reflects the geomorphic age and kind or degree of soil development.

Following is a complete sequence of surfaces in the order of their age, from the youngest to the oldest. The terminology is that used in the discussion of Jackson County, Oregon. No detailed geomorphic mapping has been done in Josephine County, but the geomorphic surfaces discussed are known to occur. Other landforms may be recognized with a detailed geomorphic study.

Horseshoe surface.—The Horseshoe surface is the lower of the two flood plains of the Rogue, Illinois, and Applegate Rivers and many other small tributaries. Flooding can occur annually. This surface has low relief and includes the river channel, point bar deposits, channel fillings, and abandoned meanders. It is commonly underlain by sand and gravel and, in some places, by bedrock. Many areas of the Horseshoe surface support young stands of deciduous trees and shrubs, while others are devoid of vegetation. Rapid changes in the Horseshoe landscape result from the cutting of new channels, the abandonment of older channels, the lateral migration of meanders, and downstream movement of alluvial deposits. The Horseshoe surface probably began to develop after the settlement of the county began, as evidenced by metallic artifacts found in the alluvium associated with this surface.

Accumulation of organic matter and weak grades of structure are the only morphological evidence of soil development in the Camas soils, which are Fluventic Haploxerolls that occur on the Horseshoe surface. The surface layer of Camas soils has an irregular decrease in organic matter content with increasing depth, which indicates that the material was recently deposited by water. The soils on this surface are younger than the soils on the Eagle Point surface.

Eagle Point surface.—The Eagle Point surface is the higher of the two flood plains of the Rogue, Illinois, and Applegate Rivers and other small tributaries. The topography of the Eagle Point surface typically consists of undulating corrugations with a maximum relief of 6 feet and is produced by channeling when the streams overflow their banks. This surface commonly is subject to flooding. It geomorphically occurs between the Tou Velle and Horseshoe surfaces and is assumed to have formed in the late Holocene.

The horizon development in the soils on the Eagle Point surface is limited to accumulation of organic matter and the formation of a cambic horizon. The Newberg soils, which are Fluventic Haploxerolls, formed in sandy alluvium. The Evans soils, which are Cumulic Haploxerolls, formed in loamy alluvium. Both of these soils have an irregular decrease in organic matter

content with increasing depth, which indicates that most of the material was recently deposited by water. The Evans soils have a surface layer that is thicker than that of the Newberg soils. Soil development has been minimal on the Eagle Point surface. The hue is dominantly 10YR.

Tou Velle surface.—The Tou Velle surface is one of the most extensive surfaces in the Rogue, Applegate, and Illinois River Valleys. Most of it consists of alluvial terraces with the low relief of bar and channel topography. The sediment in the surface layer is mostly medium textured and is underlain by sand and gravel.

The earlier stages of alluviation that produced the Tou Velle surface were contemporaneous with the formation of Crater Lake. A thin layer of ash from Mt. Mazama occurs in some soils on this surface in Jackson County, although no volcanic ash has been identified in Josephine County. A radiocarbon date obtained for charcoal from a sycamore tree (*Platanus racemosa*), which was found under a pumice flow along the Rogue River in Jackson County, provides a maximum date for the Tou Velle surface of 6,930 years, plus or minus 115 years. Therefore, it is likely the Tou Velle surface in Josephine County developed during the early Holocene.

Several soils on the Tou Velle surface, such as the Banning and Foehlin soils, have developed an argillic horizon. A radiocarbon date obtained from a partially mineralized white oak (*Quercus garryanna*) log in Jackson County is 2,355 years, plus or minus 90 years. It was exhumed from a depth of 2.7 meters under the Tou Velle surface. It can be assumed, therefore, that no more than 2,000 to 3,000 years is required for an argillic horizon to develop in this area.

On this geomorphic surface, parent material is an important factor in soil development. The main types of parent material in which the soils on this surface formed are (1) coarse-textured mixed alluvium, (2) fine-textured mixed alluvium, and (3) fine-textured serpentinitic alluvium. The soils that formed in coarse-textured mixed alluvium generally have a cambic horizon. Two soils that have a cambic horizon are the Barron and Central Point soils. Soils such as Banning and Foehlin, which formed in fine-textured mixed alluvium, commonly have an argillic horizon. In a few areas of the Tou Velle surface are soils that formed in fine-textured alluvium derived from ultramafic rock, such as serpentinite and peridotite. The Brockman and Copsey soils have serpentinitic mineralogy because of the parent material in which they formed. These soils generally have a cambic horizon.

The color of the subsoil in a soil may indicate the degree of chemical weathering that has occurred. As weathering increases, the amount of free iron increases; however, the amount of free iron decreases with increasingly poorer drainage. Parent material such as ultramafic rock has a high content of iron-bearing minerals, while granitic rock is lower in iron-bearing minerals. Thus, an equal amount of weathering will release more free iron in the former than in the latter. As the percentage of free iron increases, the hue becomes redder. Comparison of the color of soils on the same geomorphic surface can indicate the ease of weathering of a variety of parent materials. Comparison of soils that developed from the same parent material on other geomorphic surfaces can also indicate relative degrees of weathering. For example, on the Tou Velle surface the Barron soils formed in alluvium derived from granitic rock, which weathers slowly, and have hue of 2.5Y in the subsoil. The Kerby soils formed in alluvium derived from metamorphosed volcanic and sedimentary rock and have hue of 10YR and 7.5YR in the subsoil. The Brockman soils formed in alluvium derived from easily weathered serpentinite and peridotite and have hue of 2.5YR and 5YR in the subsoil.

Hanley surface.—The Hanley surface is the oldest stable geomorphic surface in the county. This surface consists of dissected flats above the main valley floor and is underlain by weathered gravel, saprolite, clay, or bedrock. The age of the Hanley surface is probably middle Pleistocene.

A great variety of soils are on this surface. Examples are the Manita and Pollard soils, which are Haploxeralfs and Haploxerults, respectively. These soils are in different moisture and precipitation zones. The Manita soils are in the zone receiving less than 35 inches of precipitation. They have high base saturation as compared to soils in the zone receiving more precipitation. The Pollard soils are in the zone receiving more than 35 inches of precipitation. Their base saturation is low because of leaching.

The soils on this geomorphic surface that formed in material derived from ultramafic rock, such as serpentinite and peridotite, have serpentinitic mineralogy. These soils are Ochrepts. They are clayey and have a cambic horizon. The Eightlar soils are an example.

The hue of the subsoil of the Manita and Pollard soils is 2.5YR, 5YR, or 7.5YR. The hue is redder than that of the soils on any other geomorphic surface that formed in similar parent material. The soils on this geomorphic surface exhibit more development than the soils on other geomorphic surfaces in the county because of the greater age of the surface and, therefore, the time available for pedogenesis to take place. Detailed geomorphic mapping at a larger scale would distinguish several distinct landforms on this surface.

Looney surface.—Because of variable landscape stability and the scale of geomorphic mapping, the soils and landscape of the Looney surface fit no particular span of time. Steep, rugged topography is typical of the Looney geomorphic surface. This surface is essentially the mountains and hills of the county. Erosion is active on much of this surface, and there are some areas of mass movement. The soils that formed in areas of this surface vary considerably. They range from Inceptisols to Ultisols. Their texture and mineralogy are affected by the parent material, as is their depth.

Much of Josephine County consists of metavolcanic and sedimentary rock of the Applegate, Rogue, and

Galice Formations. Many areas consist of soils overlying hard, relatively unweathered bedrock. These soils are shallow to moderately deep. Their mineralogy is mixed, and they are medium textured. Profile development in these soils is generally limited to development of a cambic horizon. Examples of Ochrepts on this surface are the Beekman, Colestine, and Jayar soils.

In many areas bedrock has been weathered to saprolite. The soils that formed in this material exhibit more development than the soils that formed in material derived from hard bedrock, are commonly on older geomorphic surfaces, are moderately deep or deep, and are moderately fine textured. Some soils have fragments of hard rock in the solum and soft bedrock in the underlying horizon, indicating a lithologic discontinuity. This discontinunity indicates that the soils formed in colluvium. Argillic horizons have formed in most of these soils. Examples of these Xeralfs are the Voorhies and Speaker soils. These soils have hue redder than that of the Ochrepts, indicating a higher degree of weathering. The Ochrepts are on the steep, active slopes, and the Xeralfs are on relatively stable, moderate slopes.

Soils that developed from granitic rock, principally granodiorite and quartz-diorite, are similar in many characteristics. All have coarse texture and mixed mineralogy. Profile development in these soils is minimal. Many areas consist of weathered bedrock that can be easily excavated by hand or light machinery. Examples of these Inceptisols with paralithic contact are the Goodwin, Siskiyou, and Tethrick soils. Other areas consist of hard, unweathered granitic bedrock underlying soils that have a lithic contact, such as the Crannler soils. Glacial till occurs in basins formerly occupied by glaciers. Accumulation of colluvial material and organic matter has contributed to the formation of Umbrepts, such as the Bigelow soils.

Soils that developed from ultramafic rock such as peridotite and serpentine are fine textured and have serpentinitic mineralogy. These soils have an argillic or cambic horizon and are Xeralfs or Ochrepts. Clay minerals are dominantly semotites. There is great variation in the properties of serpentinitic soils; however, high base saturation, the predominance of magnesium as an exchangeable cation, and a low ratio of exchangeable calcium to magnesium are common features. In addition, serpentinitic soils have low available phosphorus and potassium and are neutral in reaction. Most of the serpentinitic soils are in the southwestern part of the county, but smaller areas outcrop in the northeastern part. The Pearsoll and Dubakella soils formed in colluvium on moderate slopes. Associated with the serpentinitic soils are the Cornutt soils. They are so influenced by serpentine minerals that plant growth is affected; however, serpentine minerals are not abundant enough to classify the soils as serpentinitic.

Volcanic tuff and breccia occur in the northeastern part of the county. The Jumpoff soils formed in these easily weathered, clayey materials.

In the west-central part of the county, olivine gabbro has contributed to the development of the Fantz and Knapke soils. Accumulation of organic matter is sufficient for a mollic epipedon. Although leaching has been substantial in these soils, the high content of magnesium derived from the parent rock maintains the base saturation at a high level.

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glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Anadromous fish. Fish having a life history that includes both freshwater streams and the ocean. Reproduction and early rearing take place in the stream, and growth to large size takes place in the ocean.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bulk density. The mass of dry soil per unit of bulk volume. The bulk volume is determined before drying to constant weight at 105 degrees C.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Compaction. Increased soil bulk density and decreased porosity as a result of the application of mechanical forces on the soil.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is

not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Endemic plants. Native plants or plants that are restricted to a particular area or region.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Geomorphic surface. The part of the land surface that can be mapped. It is defined in terms of morphology, origin, age, and stability of landforms.

Geomorphology. The science of the general configuration of the earth's surface. Specifically, it is the study of the classification, description, nature, origin, and development of landforms, their relationship to underlying structures, and the history of geologic changes as recorded by the surface features.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.
A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.
C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.
R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A

soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Landform. Any physical form or feature of the earth's surface that has a characteristic shape and is produced by natural causes.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Mean annual increment (MAI). The average annual increase per acre in the volume of a stand. This is computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where a stand reaches its maximum annual rate of growth is called the culmination of mean annual increment (CMAI).

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict plants. Plants that are persistent remnants of an otherwise extinct species.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. Erosional surfaces cut into bedrock and thinly mantled with stream deposits.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited

geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water supplying capacity. Water stored in the soil at the beginning of plant growth in spring, plus rainfall not in excess of the evapotranspiration during the growing season, less runoff.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.1 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Recorded in the period 1962-77 at Cave Junction, Oregon											
January----	45.8	31.0	38.4	61	14	47	12.54	6.69	17.32	12	0.5
February---	53.4	32.6	43.0	71	19	126	6.04	2.19	9.13	9	4.1
March------	57.3	33.2	45.3	77	22	174	7.08	2.59	10.67	10	3.1
April------	63.2	34.9	49.1	85	25	283	3.19	.85	5.05	6	1.0
May--------	73.1	40.4	56.8	96	29	521	1.26	.80	8.01	3	.0
June-------	81.2	46.5	63.9	99	33	717	.36	.05	.60	1	.0
July-------	89.3	49.1	69.3	103	37	908	.13	---	.23	1	.0
August-----	87.8	48.4	68.1	103	36	871	.73	---	1.21	2	.0
September--	82.4	43.7	63.1	99	31	693	1.25	---	2.13	2	.0
October----	67.6	38.4	53.0	88	24	403	3.67	1.30	5.56	7	.0
November---	52.7	37.1	44.9	68	23	151	10.23	4.09	15.20	12	1.6
December---	45.8	33.0	39.4	63	15	77	12.14	5.25	17.74	13	5.8
Yearly:											
Average--	66.6	39.0	52.9	---	---	---	---	---	---	---	---
Extreme--	---	---	---	104	12	---	---	---	---	---	---
Total----	---	---	---	---	---	4,971	58.62	47.03	69.89	78	24.1

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.1 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Recorded in the period 1951-77 at Grants Pass, Oregon											
January---	46.7	32.8	39.8	61	16	82	6.71	3.41	9.39	11	3.3
February--	54.2	34.0	44.1	70	20	144	4.09	1.74	5.99	8	1.2
March-----	59.4	34.9	47.2	77	23	228	3.56	1.40	5.30	8	1.1
April-----	66.9	37.6	52.3	87	27	373	1.62	.65	2.39	5	.1
May-------	74.7	43.5	59.1	96	31	592	1.31	.35	2.08	5	.0
June------	82.4	49.2	65.8	101	36	774	.55	.06	.92	2	.0
July------	90.6	52.6	71.6	103	41	980	.21	---	.37	1	.0
August----	89.2	51.8	70.5	104	41	746	.46	---	.77	2	.0
September-	83.5	46.5	65.0	100	35	750	.87	.17	1.41	2	.0
October---	68.8	40.6	54.8	90	28	459	2.41	.77	3.71	6	.0
November--	53.5	37.5	45.5	70	21	185	4.71	1.71	7.11	9	.3
December--	46.3	34.1	40.2	63	17	89	6.06	2.90	8.64	11	2.5
Yearly:											
Average-	68.0	41.3	54.7	---	---	---	---	---	---	---	---
Extreme-	---	---	---	106	13	---	---	---	---	---	---
Total---	---	---	---	---	---	5,602	32.56	27.07	37.82	70	8.5

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.1 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
Recorded in the period 1951-77 at Sexton Summit, Oregon											
January---	39.7	30.0	34.8	58	13	47	7.38	3.40	10.61	12	26.8
February--	43.1	31.7	37.4	63	17	75	4.36	2.04	6.24	10	18.2
March-----	43.9	30.4	37.2	65	19	45	4.18	1.90	6.03	11	22.1
April-----	51.1	33.0	42.1	75	22	164	2.05	.92	2.97	7	9.4
May-------	59.4	38.9	49.2	85	26	307	1.88	.54	2.97	5	2.4
June------	67.1	45.2	56.1	89	31	483	.91	.23	1.43	3	.3
July------	75.9	51.9	63.9	92	38	741	.27	---	.48	1	.0
August----	74.6	52.0	63.3	93	39	722	.66	---	1.10	2	.1
September-	69.8	49.6	59.7	90	34	591	1.28	.45	1.95	3	.3
October---	58.2	42.9	50.6	81	28	346	3.14	1.18	4.71	6	3.0
November--	46.8	36.0	41.5	69	21	137	6.20	1.96	9.58	11	10.0
December--	41.3	31.6	36.3	61	16	83	6.64	3.02	9.58	13	21.8
Yearly:											
Average-	55.9	39.4	47.7	---	---	---	---	---	---	---	---
Extreme-	---	---	---	95	11	---	---	---	---	---	---
Total---	---	---	---	---	---	3,741	38.95	29.46	47.82	84	114.4

[1]A growing degree day is an index of the amount of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Recorded in the period 1962-77 at Cave Junction, Oregon			
Last freezing temperature in spring:			
1 year in 10 later than--	April 10	May 15	May 31
2 years in 10 later than--	March 28	May 7	May 26
5 years in 10 later than--	March 4	April 22	May 16
First freezing temperature in fall:			
1 year in 10 earlier than--	October 27	September 24	September 15
2 years in 10 earlier than--	November 8	October 7	September 22
5 years in 10 earlier than--	December 2	October 31	October 5
Recorded in the period 1951-77 at Grants Pass, Oregon			
Last freezing temperature in spring:			
1 year in 10 later than--	March 23	April 26	May 15
2 years in 10 later than--	March 10	April 19	May 10
5 years in 10 later than--	February 13	April 4	May 1
First freezing temperature in fall:			
1 year in 10 earlier than--	October 27	October 23	September 25
2 years in 10 earlier than--	November 11	November 2	October 3
5 years in 10 earlier than--	December 10	November 20	October 18

TABLE 2.--FREEZE DATES IN SPRING AND FALL--Continued

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Recorded in the period 1951-77 at Sexton Summit, Oregon			
Last freezing temperature in spring:			
1 year in 10 later than--	May 5	May 21	June 9
2 years in 10 later than--	April 27	May 16	June 4
5 years in 10 later than--	April 11	May 6	May 26
First freezing temperature in fall:			
1 year in 10 earlier than--	November 2	October 23	September 28
2 years in 10 earlier than--	November 14	October 30	October 6
5 years in 10 earlier than--	December 8	November 14	October 22

TABLE 3.--GROWING SEASON

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
Recorded in the period 1962-77 at Cave Junction, Oregon			
9 years in 10	119	146	119
8 years in 10	236	162	126
5 years in 10	268	191	141
2 years in 10	305	221	156
1 year in 10	331	237	164
Recorded in the period 1951-77 at Grants Pass, Oregon			
9 years in 10	248	190	141
8 years in 10	264	204	151
5 years in 10	295	230	170
2 years in 10	333	255	188
1 year in 10	>365	269	198
Recorded in the period 1951-77 at Sexton Summit, Oregon			
9 years in 10	192	162	122
8 years in 10	209	172	131
5 years in 10	240	191	148
2 years in 10	272	211	165
1 year in 10	288	221	174

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1B	Abegg gravelly loam, 2 to 7 percent slopes	8,168	0.8
1C	Abegg gravelly loam, 7 to 12 percent slopes	3,693	0.4
1D	Abegg gravelly loam, 12 to 20 percent slopes	4,978	0.5
2F	Althouse very gravelly silt loam, 35 to 75 percent north slopes	7,787	0.7
3F	Althouse very gravelly silt loam, 35 to 75 percent south slopes	4,675	0.4
4	Banning loam	2,173	0.2
5B	Barron coarse sandy loam, 2 to 7 percent slopes	3,736	0.4
5C	Barron coarse sandy loam, 7 to 12 percent slopes	163	*
6F	Beekman-Colestine complex, 50 to 80 percent north slopes	76,719	7.4
7F	Beekman-Colestine complex, 50 to 75 percent south slopes	58,047	5.6
8G	Beekman-Vermisa complex, 60 to 100 percent north slopes	34,486	3.3
9G	Beekman-Vermisa complex, 60 to 100 percent south slopes	29,541	2.8
10E	Bigelow very gravelly sandy loam, 5 to 35 percent slopes	1,258	0.1
10F	Bigelow very gravelly sandy loam, 35 to 65 percent slopes	3,000	0.3
11B	Brockman clay loam, 2 to 7 percent slopes	2,018	0.2
11C	Brockman clay loam, 7 to 12 percent slopes	1,914	0.2
12B	Brockman cobbly clay loam, 2 to 7 percent slopes	2,459	0.2
12D	Brockman cobbly clay loam, 7 to 20 percent slopes	3,694	0.4
13	Brockman Variant very gravelly loam	1,728	0.2
14	Camas gravelly sandy loam	2,782	0.3
15	Camas-Newberg complex	3,533	0.3
16	Central Point sandy loam	1,904	0.2
17B	Clawson sandy loam, 2 to 7 percent slopes	4,278	0.4
18A	Copsey clay, 0 to 3 percent slopes	700	0.1
18B	Copsey clay, 3 to 7 percent slopes	666	0.1
19D	Cornutt-Dubakella complex, 7 to 20 percent slopes	1,122	0.1
19E	Cornutt-Dubakella complex, 20 to 35 percent slopes	4,024	0.4
20F	Cornutt-Dubakella complex, 35 to 55 percent north slopes	12,569	1.2
21F	Cornutt-Dubakella complex, 35 to 55 percent south slopes	28,153	2.7
22	Cove silty clay loam	650	0.1
23G	Crannler very stony sandy loam, 50 to 90 percent slopes	5,866	0.6
24G	Crannler-Rock outcrop complex, 50 to 100 percent slopes	5,246	0.5
25E	Cryaquepts, 0 to 30 percent slopes	1,452	0.1
26F	Cryumbrepts, very steep	6,757	0.6
27C	Debenger loam, 7 to 12 percent slopes	165	*
27D	Debenger loam, 12 to 20 percent slopes	209	*
28F	Dubakella-Pearsoll complex, 35 to 75 percent north slopes	16,876	1.6
29F	Dubakella-Pearsoll complex, 35 to 70 percent south slopes	20,541	2.0
30	Dumps	1,368	0.1
31D	Eightlar extremely stony clay, 5 to 20 percent slopes	2,747	0.3
31E	Eightlar extremely stony clay, 20 to 35 percent slopes	5,276	0.5
32F	Eightlar-Dubakella complex, 35 to 65 percent north slopes	6,688	0.6
33F	Eightlar-Dubakella complex, 35 to 65 percent south slopes	6,147	0.6
34	Evans loam	2,575	0.2
35F	Fantz-Knapke complex, 35 to 85 percent north slopes	4,896	0.5
36F	Fantz-Knapke complex, 35 to 85 percent south slopes	5,337	0.5
37G	Fantz-Rock outcrop complex, 60 to 100 percent slopes	1,085	0.1
38A	Foehlin gravelly loam, 0 to 3 percent slopes	3,682	0.4
38C	Foehlin gravelly loam, 3 to 12 percent slopes	1,226	0.1
39D	Goodwin very stony sandy loam, 5 to 35 percent slopes	297	*
40F	Goodwin very stony sandy loam, 35 to 65 percent north slopes	2,627	0.3
41F	Goodwin very stony sandy loam, 35 to 65 percent south slopes	3,250	0.3
42B	Holland sandy loam, cool, 2 to 7 percent slopes	1,677	0.2
42C	Holland sandy loam, cool, 7 to 12 percent slopes	5,154	0.5
42D	Holland sandy loam, cool, 12 to 20 percent slopes	9,832	0.9
42E	Holland sandy loam, cool, 20 to 35 percent slopes	4,050	0.4
43E	Jayar very gravelly loam, 20 to 35 percent slopes	2,107	0.2
44F	Jayar very gravelly loam, 35 to 70 percent north slopes	19,137	1.9
45F	Jayar very gravelly loam, 35 to 70 percent south slopes	10,839	1.0
46	Jerome sandy loam	1,586	0.2
47E	Josephine gravelly loam, 20 to 35 percent slopes	16,489	1.6
48F	Josephine gravelly loam, 35 to 55 percent north slopes	70,771	6.8
49D	Jumpoff clay loam, 7 to 20 percent slopes	879	0.1
49E	Jumpoff clay loam, 20 to 35 percent slopes	1,047	0.1
50F	Jumpoff clay loam, 35 to 50 percent north slopes	3,009	0.3
51F	Jumpoff clay loam, 35 to 50 percent south slopes	3,096	0.3
52	Kerby loam	4,645	0.4
53B	Manita loam, 2 to 7 percent slopes	2,970	0.3
53C	Manita loam, 7 to 12 percent slopes	4,849	0.5
53D	Manita loam, 12 to 20 percent slopes	3,713	0.4

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
53E	Manita loam, 20 to 35 percent slopes	4,670	0.4
54F	Manita loam, 35 to 50 percent north slopes	1,153	0.1
55F	Manita loam, 35 to 50 percent south slopes	1,626	0.2
56F	McMullin gravelly loam, 30 to 60 percent slopes	381	*
57	Newberg fine sandy loam	3,575	0.3
58F	Pearsoll-Rock outcrop complex, 20 to 60 percent slopes	31,562	3.0
58G	Pearsoll-Rock outcrop complex, 60 to 90 percent slopes	33,993	3.3
59F	Perdin cobbly loam, 30 to 50 percent north slopes	3,382	0.3
60F	Perdin cobbly loam, 30 to 50 percent south slopes	2,221	0.2
61B	Pollard loam, 2 to 7 percent slopes	6,865	0.7
61C	Pollard loam, 7 to 12 percent slopes	6,624	0.6
61D	Pollard loam, 12 to 20 percent slopes	8,074	0.8
61E	Pollard loam, 20 to 35 percent slopes	7,735	0.7
62F	Pollard gravelly loam, 35 to 50 percent slopes	1,867	0.2
63F	Pollard-Beekman complex, 12 to 70 percent slopes	5,413	0.5
64	Riverwash	3,278	0.3
65F	Rogue-Goodwin complex, 35 to 70 percent north slopes	4,470	0.4
66F	Rogue-Goodwin complex, 35 to 70 percent south slopes	3,484	0.3
67B	Ruch gravelly silt loam, 2 to 7 percent slopes	2,306	0.2
67C	Ruch gravelly silt loam, 7 to 12 percent slopes	2,120	0.2
68B	Selmac loam, 2 to 7 percent slopes	3,132	0.3
68D	Selmac loam, 7 to 20 percent slopes	1,324	0.1
69E	Siskiyou gravelly sandy loam, 20 to 35 percent slopes	3,032	0.3
70F	Siskiyou gravelly sandy loam, 35 to 70 percent north slopes	7,736	0.7
71F	Siskiyou gravelly sandy loam, 35 to 60 percent south slopes	12,840	1.2
72F	Speaker-Josephine gravelly loams, 35 to 55 percent south slopes	87,238	8.5
73	Takilma cobbly loam	8,011	0.8
74	Takilma Variant extremely cobbly loam	1,647	0.2
75F	Tethrick gravelly fine sandy loam, 45 to 70 percent north slopes	4,393	0.4
76F	Tethrick gravelly fine sandy loam, 45 to 65 percent south slopes	3,214	0.3
77E	Vannoy silt loam, 20 to 35 percent slopes	2,207	0.2
78F	Vannoy silt loam, 35 to 55 percent north slopes	12,332	1.2
79F	Vannoy-Voorhies complex, 35 to 55 percent south slopes	20,920	2.0
80G	Vermisa-Beekman complex, 60 to 100 percent north slopes	43,025	4.1
81G	Vermisa-Beekman complex, 60 to 100 percent south slopes	56,564	5.5
82G	Vermisa-Rock outcrop complex, 60 to 100 percent south slopes	36,741	3.5
83	Wapato silt loam	1,233	0.1
84F	Witzel-Rock outcrop complex, 30 to 75 percent slopes	2,852	0.3
85G	Woodseye very gravelly loam, 50 to 90 percent south slopes	3,795	0.4
86G	Woodseye-Jayar complex, 50 to 90 percent north slopes	5,128	0.5
87F	Woodseye-Rock outcrop complex, 20 to 60 percent slopes	5,144	0.5
	Water, small	1,759	0.2
	Water, large	153	*
	Total	1,040,000	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only soils suitable for these crops are listed]

Soil name and map symbol	Alfalfa hay		Grass hay		Pasture		Corn silage	
	N	I	N	I	N	I	N	I
	Ton	Ton	Ton	Ton	AUM*	AUM*	Ton	Ton
1B---------- Abegg	---	---	---	5	2	13	---	---
1C, 1D---------- Abegg	---	---	---	5	2	13	---	---
4---------- Banning	---	---	---	4	4	10	---	---
5B---------- Barron	3	7	---	5	2	13	---	25
5C---------- Barron	3	7	---	5	2	13	---	25
11B---------- Brockman	---	---	---	4	2	10	---	---
11C---------- Brockman	---	---	---	4	2	10	---	---
12B---------- Brockman	---	---	---	---	2	9	---	---
12D---------- Brockman	---	---	---	---	2	9	---	---
14---------- Camas	---	---	---	2.5	---	6	---	---
15---------- Camas-Newberg	2	---	---	4	---	10	---	---
16---------- Central Point	3	8	---	5.5	2	14	---	30
17B---------- Clawson	---	---	---	5	4	13	---	---
18A---------- Copsey	---	---	---	5	4	13	---	---
18B---------- Copsey	---	---	---	5	4	13	---	---
22---------- Cove	---	---	---	5	4	13	---	---
27C, 27D---------- Debenger	---	---	---	4	2	10	---	---
34---------- Evans	3	8	---	5.5	5	14	---	30
38A---------- Foehlin	3.5	7	---	5.0	3	13	---	25
38C---------- Foehlin	3.5	7	---	5.0	3	13	---	25

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Alfalfa hay		Grass hay		Pasture		Corn silage	
	N	I	N	I	N	I	N	I
	Ton	Ton	Ton	Ton	AUM*	AUM*	Ton	Ton
42B---------- Holland	3	6.5	---	5	2	13	---	20
42C---------- Holland	3	6.0	---	4.5	2	11	---	---
42D---------- Holland	2.5	5.0	---	4	2	10	---	---
42E---------- Holland	---	---	---	---	2	---	---	---
46---------- Jerome	---	---	---	4	4	10	---	---
49D---------- Jumpoff	---	---	---	4.5	3	11	---	---
49E---------- Jumpoff	---	---	---	---	3	---	---	---
52---------- Kerby	3	7	1.5	5.5	3	13	---	24
53B---------- Manita	3.5	7.0	---	5	3	13	---	25
53C---------- Manita	3.5	7.0	---	5	3	13	---	---
53D---------- Manita	3.0	6.5	---	5	3	13	---	---
53E---------- Manita	---	5.0	---	4	3	10	---	---
54F---------- Manita	---	---	---	---	2	---	---	---
57---------- Newberg	3	7	---	5.5	2	14	---	30
61B---------- Pollard	3.5	7	---	5	3	13	---	25
61C---------- Pollard	3.5	7	---	5	3	13	---	---
61D---------- Pollard	3	6.5	---	5	3	13	---	---
61E---------- Pollard	---	5.0	---	4	3	10	---	---
67B---------- Ruch	3.5	7.0	---	5.0	3	13	---	25
67C---------- Ruch	3.5	6.5	---	5.0	3	13	---	25
68B---------- Selmac	---	---	---	4.0	3	10	---	---
68D---------- Selmac	---	---	---	---	3	10	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Alfalfa hay		Grass hay		Pasture		Corn silage	
	N	I	N	I	N	I	N	I
	Ton	Ton	Ton	Ton	AUM*	AUM*	Ton	Ton
73---------- Takilma	---	---	---	4.5	2	11	---	---
83---------- Wapato	---	---	---	5	4	13	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index**	
1B, 1C, 1D--------- Abegg	4f	Moderate	Moderate	Slight	Moderate	Douglas-fir--------- Ponderosa pine------ California black oak Pacific madrone-----	114(3) --- --- ---	Douglas-fir, ponderosa pine.
2F---------- Althouse	4f 2f 2f	Severe	Slight	Moderate	Moderate	Douglas-fir--------- White fir---------- Shasta red fir------	113 80 50	Shasta red fir, Douglas-fir.
3F---------- Althouse	5f 3f 3f	Severe	Moderate	Moderate	Moderate	Douglas-fir--------- White fir---------- Shasta red fir------	95 70 40	Shasta red fir, Douglas-fir.
5B, 5C---------- Barron	2s	Slight	Severe	Slight	Moderate	Ponderosa pine------ Douglas-fir---------	110(1) ---	Ponderosa pine, Douglas-fir.
6F*: Beekman---------- Colestine---------	4f 4r	Severe Severe	Moderate Moderate	Slight Slight	Moderate Moderate	Douglas-fir--------- Pacific madrone----- California black oak Douglas-fir--------- Pacific madrone----- California black oak	115-5 --- --- 124(1) --- ---	Douglas-fir, ponderosa pine. Douglas-fir, ponderosa pine.
7F*: Beekman---------- Colestine---------	4f 4r	Severe Severe	Moderate Moderate	Slight Slight	Moderate Moderate	Douglas-fir--------- Pacific madrone----- California black oak Douglas-fir--------- Ponderosa pine------ Pacific madrone----- California black oak	105 --- --- 110 --- --- ---	Douglas-fir, ponderosa pine. Douglas-fir, ponderosa pine.
8G*: Beekman---------- Vermisa----------	4f 5d	Severe Severe	Moderate Severe	Slight Severe	Moderate Slight	Douglas-fir--------- Pacific madrone----- California black oak Douglas-fir--------- Canyon live oak-----	115-5 --- --- 70 ---	Douglas-fir, ponderosa pine. Douglas-fir, ponderosa pine.
9G*: Beekman---------- Vermisa----------	4f 5d	Severe Severe	Moderate Severe	Slight Severe	Moderate Slight	Douglas-fir--------- Pacific madrone----- California black oak Douglas-fir--------- Canyon live oak-----	105 --- --- 70 ---	Douglas-fir, ponderosa pine. Douglas-fir, ponderosa pine.
10E---------- Bigelow	3f	Moderate	Severe	Moderate	Moderate	Shasta red fir------ White fir---------- Mountain hemlock----	40 --- ---	Shasta red fir, white fir.
10F---------- Bigelow	3f	Severe	Severe	Severe	Moderate	Shasta red fir------ White fir---------- Mountain hemlock----	40 --- ---	Shasta red fir, white fir.
13---------- Brockman Variant	5t	Slight	Moderate	Slight	Moderate	Douglas-fir---------	95(1)	Douglas-fir, Jeffrey pine, incense-cedar.

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index**	
19D*, 19E*:								
Cornutt	4x	Moderate	Moderate	Slight	Moderate	Douglas-fir Ponderosa pine Pacific madrone	97(2) --- ---	Ponderosa pine, Jeffrey pine, Douglas-fir, incense-cedar.
Dubakella	5t	Slight	Severe	Moderate	Moderate	Ponderosa pine Jeffrey pine Incense-cedar	60 60 ---	Jeffrey pine, incense-cedar.
20F*:								
Cornutt	4x	Severe	Moderate	Slight	Moderate	Douglas-fir Ponderosa pine Pacific madrone	97(2) --- ---	Ponderosa pine, Jeffrey pine, Douglas-fir, incense-cedar.
Dubakella	5t	Moderate	Severe	Moderate	Moderate	Ponderosa pine Jeffrey pine Incense-cedar	60 60 ---	Jeffrey pine, incense-cedar.
21F*:								
Cornutt	5x	Severe	Severe	Slight	Moderate	Douglas-fir Ponderosa pine Pacific madrone	90 --- ---	Jeffrey pine, ponderosa pine, Douglas-fir, incense-cedar.
Dubakella	5t	Moderate	Severe	Moderate	Moderate	Ponderosa pine Jeffrey pine Incense-cedar	60 60 ---	Jeffrey pine, incense-cedar.
23G Crannler	4x	Severe	Severe	Severe	Severe	Shasta red fir White fir Mountain hemlock	30 26 ---	Shasta red fir.
24G*:								
Crannler	4x	Severe	Severe	Severe	Severe	Shasta red fir White fir Mountain hemlock	30 26 ---	Shasta red fir.
Rock outcrop.								
35F*:								
Fantz	5f	Severe	Severe	Severe	Severe	Douglas-fir Ponderosa pine Incense-cedar Jeffrey pine	75 --- --- ---	Douglas-fir, ponderosa pine, Jeffrey pine, incense-cedar.
Knapke	5f	Severe	Severe	Moderate	Severe	Douglas-fir Ponderosa pine Incense-cedar Jeffrey pine	75 --- --- ---	Douglas-fir, ponderosa pine, Jeffrey pine, incense-cedar.
36F*:								
Fantz	5f	Severe	Severe	Severe	Severe	Douglas-fir Ponderosa pine Jeffrey pine	50 --- ---	Ponderosa pine, Douglas-fir, Jeffrey pine.
Knapke	5f	Severe	Severe	Moderate	Severe	Douglas-fir Ponderosa pine Incense-cedar Jeffrey pine	75 --- --- ---	Douglas-fir, ponderosa pine, Jeffrey pine.
39D Goodwin	2f	Severe	Severe	Moderate	Moderate	Shasta red fir White fir	50 80	Shasta red fir, white fir.
40F Goodwin	2f	Severe	Severe	Moderate	Moderate	Shasta red fir White fir	50 80	Shasta red fir, white fir.

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index**	
41F---------- Goodwin	3f	Severe	Severe	Moderate	Moderate	Shasta red fir------	40	Shasta red fir, white fir.
						White fir----------	70	
42B, 42C---------- Holland	2o	Moderate	Severe	Slight	Severe	Ponderosa pine------	110(3)	Douglas-fir, ponderosa pine.
	4o					Douglas-fir---------	109(1)	
						Sugar pine----------	---	
						Pacific madrone-----	---	
42D, 42E---------- Holland	2o	Moderate	Severe	Slight	Moderate	Ponderosa pine------	100(1)	Ponderosa pine, Douglas-fir.
	5o					Douglas-fir---------	94(1)	
						Sugar pine----------	---	
						Pacific madrone-----	---	
43E---------- Jayar	4f	Moderate	Moderate	Moderate	Moderate	Douglas-fir---------	118(1)	Douglas-fir, Shasta red fir.
	2f					White fir----------	80	
	2f					Shasta red fir------	50	
44F---------- Jayar	4f	Severe	Moderate	Moderate	Moderate	Douglas-fir---------	118	Douglas-fir, Shasta red fir.
	2f					White fir----------	80	
	2f					Shasta red fir------	50	
45F---------- Jayar	5f	Severe	Severe	Moderate	Moderate	Douglas-fir---------	95	Douglas-fir, Shasta red fir.
	3f					White fir----------	70	
	3f					Shasta red fir------	40	
47E---------- Josephine	4o	Moderate	Moderate	Slight	Moderate	Douglas-fir---------	120-7	Douglas-fir.
						Ponderosa pine------	---	
						Pacific madrone-----	---	
48F---------- Josephine	3r	Severe	Moderate	Slight	Moderate	Douglas-fir---------	130-8	Douglas-fir.
						Ponderosa pine------	---	
						Pacific madrone-----	---	
49D, 49E---------- Jumpoff	5r	Moderate	Moderate	Moderate	Moderate	Douglas-fir---------	90(3)	Douglas-fir, ponderosa pine, incense-cedar.
						Incense-cedar-------	---	
50F---------- Jumpoff	4r	Severe	Moderate	Moderate	Moderate	Douglas-fir---------	120(2)	Douglas-fir, ponderosa pine, incense-cedar.
						Sugar pine----------	---	
						Incense-cedar-------	90	
51F---------- Jumpoff	5r	Severe	Severe	Moderate	Severe	Douglas-fir---------	90(3)	Douglas-fir, ponderosa pine, incense-cedar.
						Pacific madrone-----	---	
						Black oak----------	---	
53B, 53C---------- Manita	5o	Slight	Moderate	Slight	Moderate	Douglas-fir---------	94(2)	Douglas-fir, ponderosa pine.
						Ponderosa pine------	---	
						Pacific madrone-----	---	
53D---------- Manita	5o	Slight	Moderate	Slight	Moderate	Douglas-fir---------	94(2)	Douglas-fir, ponderosa pine.
						Ponderosa pine------	---	
						Pacific madrone-----	---	
53E---------- Manita	5o	Moderate	Moderate	Slight	Moderate	Douglas-fir---------	94(2)	Douglas-fir, ponderosa pine.
						Ponderosa pine------	---	
						Pacific madrone-----	---	
54F---------- Manita	4r	Severe	Moderate	Slight	Moderate	Douglas-fir---------	110(1)	Douglas-fir, ponderosa pine.
						Ponderosa pine------	---	
						Pacific madrone-----	---	
55F---------- Manita	4r	Severe	Moderate	Slight	Moderate	Douglas-fir---------	109(1)	Douglas-fir, ponderosa pine.
						Ponderosa pine------	---	
						Pacific madrone-----	---	

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index**	
61B, 61C---------- Pollard	3o 2o	Slight	Slight	Slight	Moderate	Douglas-fir--------- Ponderosa pine------ Sugar pine---------- Pacific madrone-----	126-7 108 --- ---	Douglas-fir, ponderosa pine.
61D---------- Pollard	3o 2o	Slight	Slight	Slight	Moderate	Douglas-fir--------- Ponderosa pine------ Sugar pine---------- Pacific madrone-----	126-7 108 --- ---	Douglas-fir, ponderosa pine.
61E---------- Pollard	3o	Moderate	Slight	Slight	Moderate	Douglas-fir--------- Ponderosa pine------ Sugar pine---------- Pacific madrone-----	126-7 108 --- ---	Douglas-fir, ponderosa pine.
62F---------- Pollard	4r 3r	Severe	Moderate	Slight	Moderate	Douglas-fir--------- Ponderosa pine------	116(1) 95	Douglas-fir, ponderosa pine.
63F*: Pollard----------	3o 2o	Moderate	Slight	Slight	Moderate	Douglas-fir--------- Ponderosa pine------ Sugar pine---------- Pacific madrone-----	126-7 108 --- ---	Douglas-fir, ponderosa pine.
Beekman----------	4f	Severe	Moderate	Slight	Moderate	Douglas-fir--------- Pacific madrone----- California black oak	115-5 --- ---	Douglas-fir, ponderosa pine.
65F*: Rogue----------	2s 2s	Severe	Severe	Moderate	Moderate	White fir---------- Shasta red fir------	80 50	Shasta red fir, white fir.
Goodwin----------	2f 2f	Severe	Severe	Moderate	Moderate	White fir---------- Shasta red fir------	80 50	Shasta red fir, white fir.
66F*: Rogue----------	3s 3s	Severe	Severe	Moderate	Moderate	Shasta red fir------ White fir----------	40 70	Shasta red fir, white fir.
Goodwin----------	3f 3f	Severe	Severe	Moderate	Moderate	Shasta red fir------ White fir----------	40 70	Shasta red fir, white fir.
67B---------- Ruch	1o 5o	Moderate	Severe	Slight	Severe	Ponderosa pine------ Douglas-fir--------- Pacific madrone-----	120(3) 92-6 ---	Ponderosa pine, Douglas-fir.
67C---------- Ruch	1o 5o	Moderate	Severe	Slight	Severe	Ponderosa pine------ Douglas-fir--------- Pacific madrone-----	120(3) 92-6 ---	Ponderosa pine, Douglas-fir.
69E---------- Siskiyou	4s	Moderate	Severe	Slight	Moderate	Douglas-fir--------- Ponderosa pine------ Sugar pine----------	101-8 --- ---	Douglas-fir, ponderosa pine.
70F---------- Siskiyou	4s	Severe	Moderate	Moderate	Moderate	Douglas-fir--------- Pacific madrone----- California black oak	101-8 --- ---	Douglas-fir, ponderosa pine.
71F---------- Siskiyou	5s	Severe	Severe	Moderate	Moderate	Douglas-fir--------- Ponderosa pine------ Sugar pine----------	90(1) --- ---	Douglas-fir, ponderosa pine.
72F*: Speaker----------	4r	Severe	Severe	Moderate	Moderate	Douglas-fir--------- Ponderosa pine------	113-3 ---	Douglas-fir, ponderosa pine.

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index**	
72F*: Josephine	4r	Severe	Severe	Slight	Moderate	Douglas-fir Ponderosa pine Pacific madrone	121-7 --- ---	Douglas-fir, ponderosa pine.
75F Tethrick	4r	Severe	Moderate	Moderate	Moderate	Douglas-fir Ponderosa pine	105(2) ---	Douglas-fir, ponderosa pine.
76F Tethrick	5r	Severe	Severe	Moderate	Moderate	Douglas-fir Ponderosa pine	95 ---	Douglas-fir, ponderosa pine.
77E Vannoy	4o	Moderate	Moderate	Slight	Moderate	Douglas-fir Ponderosa pine Pacific madrone California black oak	110 --- --- ---	Douglas-fir, ponderosa pine.
78F Vannoy	4r	Severe	Moderate	Slight	Moderate	Douglas-fir Ponderosa pine Pacific madrone	110 --- ---	Douglas-fir, ponderosa pine.
79F*: Vannoy	4r	Severe	Severe	Slight	Severe	Douglas-fir Ponderosa pine California black oak Pacific madrone	105(3) --- --- ---	Douglas-fir, ponderosa pine.
Voorhies	5f	Severe	Severe	Slight	Moderate	Douglas-fir Ponderosa pine Pacific madrone California black oak	90 65 --- ---	Douglas-fir, ponderosa pine.
80G*: Vermisa	5d	Severe	Severe	Severe	Slight	Douglas-fir Canyon live oak	70 ---	Douglas-fir, ponderosa pine.
Beekman	4f	Severe	Moderate	Slight	Moderate	Douglas-fir Pacific madrone California black oak	115-5 --- ---	Douglas-fir, ponderosa pine.
81G*: Vermisa	5d	Severe	Severe	Severe	Slight	Douglas-fir Canyon live oak	70 ---	Douglas-fir, ponderosa pine.
Beekman	4f	Severe	Moderate	Slight	Moderate	Douglas-fir Pacific madrone California black oak	105 --- ---	Douglas-fir, ponderosa pine.
85G Woodseye	5f 3f	Severe	Severe	Severe	Moderate	Douglas-fir White fir	80 70	Douglas-fir, Shasta red fir.
86G*: Woodseye	5f 3f	Severe	Severe	Severe	Moderate	Douglas-fir White fir	80 70	Douglas-fir, Shasta red fir.
Jayar	4f 2f 2f	Severe	Moderate	Moderate	Moderate	Douglas-fir White fir Shasta red fir	118(1) 80 50	Douglas-fir. Shasta red fir.

* See description of the map unit for composition and behavior characteristics of the map unit.

** Average site index, based on sampling, is given for the listed species. Where four or more plots were measured on the listed soil, the standard deviation is shown by a dash followed by a number for the deviation; for example, -3. Where less than four plots were measured, the number of plots is given in parentheses; for example, (2). Where no plots were measured, the site index is an estimate.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION

[Only the soils suitable for production of commercial trees are listed]

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
1B, 1C, 1D--------- Abegg	Favorable Normal Unfavorable	150 125 100	Deerbrush---------- Common snowberry---------- Pacific poison-oak---------- Blue wildrye---------- Western fescue----------	25 20 15 10 5
2F---------- Althouse	Favorable Normal Unfavorable	3,700 3,200 2,100	Pacific rhododendron---------- Beargrass---------- Cascade Oregon-grape---------- Princes pine----------	85 5 5 5
3F---------- Althouse	Favorable Normal Unfavorable	4,100 3,600 2,400	Pacific rhododendron---------- Beargrass---------- Cascade Oregon-grape---------- Princes pine----------	70 6 5 5
5B, 5C---------- Barron	Favorable Normal Unfavorable	400 350 300	Orange honeysuckle---------- Pacific poison-oak---------- Whiteleaf manzanita---------- Blue wildrye---------- Idaho fescue----------	40 30 10 10 5
6F*: Beekman-----------	Favorable Normal Unfavorable	175 150 125	Tanoak---------- Pacific dogwood---------- Cluster tarweed---------- Pacific poison-oak---------- Mountain brome---------- Deerfoot vanillaleaf---------- Common snowberry---------- Slender hairgrass---------- Huckleberry oak---------- American trailplant----------	15 10 10 10 10 5 5 5 5 5
Colestine----------	Favorable Normal Unfavorable	175 150 125	Tanoak---------- Cluster tarweed---------- Pacific poison-oak---------- Pacific dogwood---------- Deerfoot vanillaleaf---------- Common snowberry---------- Slender hairgrass---------- Huckleberry oak---------- American trailplant----------	15 10 10 5 5 5 5 5 5
7F*: Beekman-----------	Favorable Normal Unfavorable	150 125 100	Tanoak---------- Mountain brome---------- Cluster tarweed---------- Pacific poison-oak---------- Huckleberry oak---------- Pacific dogwood---------- Deerfoot vanillaleaf----------	20 15 10 10 10 5 5
Colestine----------	Favorable Normal Unfavorable	150 125 100	Tanoak---------- Pacific dogwood---------- Cluster tarweed---------- Pacific poison-oak---------- Huckleberry oak---------- Deerfoot vanillaleaf----------	20 10 10 10 10 5

See footnote at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
8G*:				
Beekman	Favorable	175	Tanoak	15
	Normal	150	Pacific dogwood	10
	Unfavorable	125	Cluster tarweed	10
			Pacific poison-oak	10
			Mountain brome	10
			Deerfoot vanillaleaf	5
			Common snowberry	5
			Slender hairgrass	5
			Huckleberry oak	5
			American trailplant	5
Vermisa	Favorable	150	Canyon live oak	15
	Normal	125	Deerbrush	10
	Unfavorable	100	Western hazel	5
			Creambush oceanspray	5
			Wedgeleaf ceanothus	5
			Vetch	5
9G*:				
Beekman	Favorable	150	Tanoak	20
	Normal	125	Mountain brome	15
	Unfavorable	100	Cluster tarweed	10
			Pacific poison-oak	10
			Huckleberry oak	10
			Pacific dogwood	5
			Deerfoot vanillaleaf	5
Vermisa	Favorable	150	Canyon live oak	30
	Normal	125	Wedgeleaf ceanothus	10
	Unfavorable	100	Deerbrush	10
			Creambush oceanspray	5
			Vetch	5
10E	Favorable	450	Chinkapin	25
Bigelow	Normal	375	Swordfern	15
	Unfavorable	300	Snowbrush ceanothus	13
			Princes pine	10
			Willow	10
			Snowberry	10
			Cascade Oregon-grape	5
10F	Favorable	500	Chinkapin	27
Bigelow	Normal	450	Cascade Oregon-grape	20
	Unfavorable	375	Snowbrush ceanothus	16
			Princes pine	14
			Swordfern	8
			Snowberry	6
13	Favorable	1,200	Whiteleaf manzanita	30
Brockman Variant	Normal	1,100	California buckthorn	15
	Unfavorable	900	Pacific poison-oak	5
19D*, 19E*:				
Cornutt	Favorable	100	Iris	30
	Normal	75	Strawberry	15
	Unfavorable	50	California fescue	15
			Tanoak	15
			Orange honeysuckle	10
			Cluster tarweed	5
			California hazel	5
Dubakella	Favorable	500	Whiteleaf manzanita	30
	Normal	300	Idaho fescue	25
	Unfavorable	200	Lemmon needlegrass	20

See footnote at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
20F*:				
Cornutt	Favorable	100	Iris	30
	Normal	75	Strawberry	15
	Unfavorable	50	California fescue	15
			Tanoak	15
			Orange honeysuckle	10
			Cluster tarweed	5
			California hazel	5
Dubakella	Favorable	150	Whiteleaf manzanita	35
	Normal	125	Idaho fescue	25
	Unfavorable	100	Lemmon needlegrass	20
21F*:				
Cornutt	Favorable	125	Iris	25
	Normal	100	California fescue	20
	Unfavorable	75	Tanoak	15
			Strawberry	10
			Orange honeysuckle	10
			Pacific poison-oak	10
			Cluster tarweed	5
			Western fescue	5
Dubakella	Favorable	500	Whiteleaf manzanita	35
	Normal	300	Idaho fescue	25
	Unfavorable	200	Lemmon needlegrass	20
23G	Favorable	175	Snowbrush ceanothus	42
Crannler	Normal	150	Snowberry	35
	Unfavorable	100	Gooseberry	15
			Cascade Oregon-grape	5
24G*:				
Crannler	Favorable	175	Snowbrush ceanothus	42
	Normal	150	Snowberry	35
	Unfavorable	100	Gooseberry	15
			Cascade Oregon-grape	5
Rock outcrop.				
31D, 31E	Favorable	1,500	Whiteleaf manzanita	55
Eightlar	Normal	1,200	Idaho fescue	15
	Unfavorable	1,000	Lemmon needlegrass	10
32F*:				
Eightlar	Favorable	150	Blue wildrye	35
	Normal	125	Western fescue	15
	Unfavorable	100	Swordfern	10
			Whiteleaf manzanita	5
			Canyon live oak	5
			California fescue	5
Dubakella	Favorable	150	Whiteleaf manzanita	35
	Normal	125	Idaho fescue	25
	Unfavorable	100	Lemmon needlegrass	20
			California scrub oak	5
33F*:				
Eightlar	Favorable	1,500	Whiteleaf manzanita	35
	Normal	1,200	Idaho fescue	25
	Unfavorable	1,000	Lemmon needlegrass	20
Dubakella	Favorable	500	Whiteleaf manzanita	35
	Normal	300	Idaho fescue	25
	Unfavorable	200	Lemmon needlegrass	20
			California scrub oak	5

See footnote at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
35F*:				
Fantz	Favorable	140	Blue wildrye	30
	Normal	120	Swordfern	25
	Unfavorable	100	Western fescue	15
			Canyon live oak	15
Knapke	Favorable	150	Blue wildrye	35
	Normal	135	Swordfern	30
	Unfavorable	110	Western fescue	15
			Canyon live oak	15
			Iris	5
36F*:				
Fantz	Favorable	130	Blue wildrye	40
	Normal	110	Western fescue	20
	Unfavorable	90	Canyon live oak	20
			Swordfern	15
Knapke	Favorable	140	Blue wildrye	40
	Normal	125	Canyon live oak	25
	Unfavorable	100	Western fescue	20
			Swordfern	10
37G*:				
Fantz	Favorable	130	Blue wildrye	40
	Normal	110	Western fescue	20
	Unfavorable	90	Canyon live oak	20
			Swordfern	15
Rock outcrop.				
39D	Favorable	800	Pacific rhododendron	50
Goodwin	Normal	700	Princes pine	15
	Unfavorable	600	Longtube twinflower	10
			Chinkapin	10
			Cascade Oregon-grape	9
40F	Favorable	800	Pacific rhododendron	50
Goodwin	Normal	700	Princes pine	15
	Unfavorable	600	Longtube twinflower	10
			Chinkapin	10
			Cascade Oregon-grape	9
41F	Favorable	750	Pacific rhododendron	35
Goodwin	Normal	650	Princes pine	15
	Unfavorable	550	Chinkapin	15
			Longtube twinflower	11
			Cascade Oregon-grape	8
			Big huckleberry	5
42B, 42C	Favorable	500	Pacific poison-oak	30
Holland	Normal	400	Deerbrush	15
	Unfavorable	300	Western fescue	15
			Orange honeysuckle	10
			Whiteleaf manzanita	5
			California brome	5
42D, 42E	Favorable	500	Deerbrush	20
Holland	Normal	400	Orange honeysuckle	20
	Unfavorable	300	Pacific poison-oak	20
			Whiteleaf manzanita	10
			Strawberry	10
			Western fescue	10
			California brome	5
			Snowberry	5

See footnote at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
43E---------- Jayar	Favorable	3,500	Pacific rhododendron----------	80
	Normal	3,150	Beargrass----------	5
	Unfavorable	2,200	Cascade Oregon-grape----------	5
			Princes pine----------	5
44F---------- Jayar	Favorable	3,500	Pacific rhododendron----------	80
	Normal	3,150	Beargrass----------	5
	Unfavorable	2,200	Cascade Oregon-grape----------	5
			Princes pine----------	5
45F---------- Jayar	Favorable	4,000	Pacific rhododendron----------	70
	Normal	3,600	Beargrass----------	5
	Unfavorable	2,400	Cascade Oregon-grape----------	5
47E---------- Josephine	Favorable	100	Iris----------	25
	Normal	75	Strawberry----------	15
	Unfavorable	50	California fescue----------	15
			Tanoak----------	15
			Orange honeysuckle----------	10
			Tarweed----------	5
			California hazel----------	5
48F---------- Josephine	Favorable	100	Iris----------	25
	Normal	75	Strawberry----------	15
	Unfavorable	50	California fescue----------	15
			Tanoak----------	15
			Orange honeysuckle----------	10
			Tarweed----------	5
			California hazel----------	5
49D, 49E---------- Jumpoff	Favorable	200	Western fescue----------	36
	Normal	150	Pacific poison-oak----------	28
	Unfavorable	125	Orange honeysuckle----------	15
			Canyon live oak----------	10
50F---------- Jumpoff	Favorable	175	Western fescue----------	35
	Normal	130	Pacific poison-oak----------	20
	Unfavorable	100	Orange honeysuckle----------	15
51F---------- Jumpoff	Favorable	200	Western fescue----------	36
	Normal	150	Pacific poison-oak----------	28
	Unfavorable	125	Orange honeysuckle----------	15
			Greenleaf manzanita----------	10
53B, 53C, 53D, 53E- Manita	Favorable	200	Deerbrush----------	25
	Normal	175	Common snowberry----------	20
	Unfavorable	150	Pacific poison-oak----------	15
			Blue wildrye----------	10
			Western fescue----------	5
54F---------- Manita	Favorable	175	Deerbrush----------	20
	Normal	150	Common snowberry----------	15
	Unfavorable	125	Pacific poison-oak----------	10
			Blue wildrye----------	5
			Western fescue----------	5
55F---------- Manita	Favorable	200	Deerbrush----------	25
	Normal	175	Common snowberry----------	15
	Unfavorable	150	Pacific poison-oak----------	15
			Blue wildrye----------	10
			Western fescue----------	5

See footnote at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
61B, 61C, 61D, 61E, 62F---------- Pollard	Favorable	1,600	Tanoak----------	55
	Normal	1,400	Western hazel----------	20
	Unfavorable	1,200	Huckleberry oak----------	10
			Orange honeysuckle----------	5
63F*:				
Pollard----------	Favorable	1,600	Tanoak----------	55
	Normal	1,400	Western hazel----------	20
	Unfavorable	1,200	Huckleberry oak----------	10
			Orange honeysuckle----------	5
Beekman----------	Favorable	175	Tanoak----------	15
	Normal	150	Pacific dogwood----------	10
	Unfavorable	125	Cluster tarweed----------	10
			Pacific poison-oak----------	10
			Mountain brome----------	10
			Deerfoot vanillaleaf----------	5
			Common snowberry----------	5
			Slender hairgrass----------	5
			Huckleberry oak----------	5
			American trailplant----------	5
65F*:				
Rogue----------	Favorable	825	Pacific rhododendron----------	48
	Normal	725	Princes pine----------	18
	Unfavorable	600	Longtube twinflower----------	11
			Chinkapin----------	10
			Cascade Oregon-grape----------	8
Goodwin----------	Favorable	800	Pacific rhododendron----------	50
	Normal	700	Princes pine----------	15
	Unfavorable	600	Longtube twinflower----------	10
			Chinkapin----------	10
			Cascade Oregon-grape----------	9
66F*:				
Rogue----------	Favorable	725	Pacific rhododendron----------	35
	Normal	650	Princes pine----------	18
	Unfavorable	525	Chinkapin----------	18
			Longtube twinflower----------	11
			Cascade Oregon-grape----------	7
Goodwin----------	Favorable	750	Pacific rhododendron----------	35
	Normal	650	Princes pine----------	15
	Unfavorable	550	Chinkapin----------	15
			Longtube twinflower----------	11
			Cascade Oregon-grape----------	8
			Big huckleberry----------	5
67B, 67C---------- Ruch	Favorable	200	Deerbrush----------	20
	Normal	175	Common snowberry----------	15
	Unfavorable	150	Whiteleaf manzanita----------	10
			Pacific poison-oak----------	5
			Blue wildrye----------	5
69E, 70F, 71F------ Siskiyou	Favorable	450	Orange honeysuckle----------	50
	Normal	375	Pacific poison-oak----------	30
	Unfavorable	300	Blue wildrye----------	10
72F*:				
Speaker----------	Favorable	160	Tanoak----------	87
	Normal	140	Western brackenfern----------	8
	Unfavorable	100		

See footnote at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
72F*:				
Josephine	Favorable	125	Iris	20
	Normal	100	California fescue	20
	Unfavorable	75	Tanoak	15
			Strawberry	10
			Orange honeysuckle	10
			Tarweed	5
			California hazel	5
			Pacific poison-oak	5
			Western fescue	5
75F	Favorable	1,000	Cascade Oregon-grape	60
Tethrick	Normal	800	Creambush oceanspray	20
	Unfavorable	700	Canyon live oak	5
76F	Favorable	1,150	Cascade Oregon-grape	30
Tethrick	Normal	1,000	Canyon live oak	20
	Unfavorable	850	Deerbrush	15
			Creambush oceanspray	15
			Western fescue	5
77E, 78F	Favorable	500	Mountain brome	30
Vannoy	Normal	400	Orange honeysuckle	20
	Unfavorable	250	Pacific poison-oak	18
			California hazel	14
			Common snowberry	5
			Brackenfern	5
			Canyon live oak	5
79F*:				
Vannoy	Favorable	500	Mountain brome	30
	Normal	400	Orange honeysuckle	20
	Unfavorable	250	Pacific poison-oak	18
			California hazel	14
			Common snowberry	5
			Brackenfern	5
			Canyon live oak	5
Voorhies	Favorable	450	Mountain brome	30
	Normal	350	Orange honeysuckle	28
	Unfavorable	205	Pacific poison-oak	11
			California fescue	10
			Whiteleaf manzanita	8
			Canyon live oak	5
80G*:				
Vermisa	Favorable	150	Canyon live oak	15
	Normal	125	Deerbrush	10
	Unfavorable	100	Western hazel	5
			Creambush oceanspray	5
			Wedgeleaf ceanothus	5
			Vetch	5
Beekman	Favorable	175	Tanoak	15
	Normal	150	Pacific dogwood	10
	Unfavorable	125	Cluster tarweed	10
			Pacific poison-oak	10
			Mountain brome	10
			Deerfoot vanillaleaf	5
			Common snowberry	5
			Slender hairgrass	5
			Huckleberry oak	5
			American trailplant	5

See footnote at end of table.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION--Continued

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
81G*:				
Vermisa	Favorable	150	Canyon live oak	30
	Normal	125	Deerbrush	10
	Unfavorable	100	Wedgeleaf ceanothus	10
			Creambush oceanspray	5
			Vetch	5
Beekman	Favorable	150	Tanoak	20
	Normal	125	Mountain brome	15
	Unfavorable	100	Cluster tarweed	10
			Pacific poison-oak	10
			Huckleberry oak	10
			Pacific dogwood	5
			Deerfoot vanillaleaf	5
85G----------	Favorable	1,300	Greenleaf manzanita	30
Woodseye	Normal	1,050	Snowbrush ceanothus	15
	Unfavorable	800	Huckleberry oak	10
			Cascade Oregon-grape	5
			Beargrass	5
86G*:				
Woodseye	Favorable	700	Cascade Oregon-grape	15
	Normal	550	Greenleaf manzanita	10
	Unfavorable	450	Beargrass	10
			Snowbrush ceanothus	5
Jayar	Favorable	3,500	Pacific rhododendron	80
	Normal	3,150	Beargrass	5
	Unfavorable	2,200	Cascade Oregon-grape	5
			Princes pine	5
87F*:				
Woodseye	Favorable	1,300	Greenleaf manzanita	30
	Normal	1,050	Snowbrush ceanothus	15
	Unfavorable	800	Huckleberry oak	10
			Cascade Oregon-grape	5
			Beargrass	5
Rock outcrop.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1B Abegg	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: dusty.
1C Abegg	Moderate: slope, small stones, dusty.	Moderate: slope, small stones, dusty.	Severe: slope, small stones.	Moderate: dusty.
1D Abegg	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.
2F, 3F Althouse	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.
4 Banning	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
5B Barron	Slight	Slight	Moderate: slope, small stones.	Slight.
5C Barron	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
6F*, 7F*: Beekman	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Colestine	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
8G*, 9G*: Beekman	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Vermisa	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones.
10E Bigelow	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.
10F Bigelow	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
11B Brockman	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones, wetness.	Slight.
11C Brockman	Moderate: wetness, slope.	Moderate: wetness, slope.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
12B---------- Brockman	Moderate: wetness.	Moderate: wetness.	Severe: small stones.	Moderate: large stones.
12D---------- Brockman	Moderate: wetness, slope.	Moderate: wetness, slope.	Severe: slope, small stones.	Moderate: large stones.
13---------- Brockman Variant	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight.
14---------- Camas	Severe: floods.	Moderate: small stones.	Severe: small stones.	Slight.
15*: Camas----------	Severe: floods.	Moderate: small stones.	Severe: small stones.	Slight.
Newberg----------	Severe: floods.	Slight----------	Moderate: floods.	Slight.
16---------- Central Point	Slight----------	Slight----------	Moderate: small stones.	Slight.
17B---------- Clawson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
18A, 18B---------- Copsey	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey.	Severe: wetness, too clayey.
19D*: Cornutt----------	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Moderate: large stones.
Dubakella----------	Moderate: large stones, slope.	Moderate: slope, large stones.	Severe: large stones, slope.	Moderate: large stones, slope.
19E*, 20F*, 21F*: Cornutt----------	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
Dubakella----------	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
22---------- Cove	Severe: floods, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.
23G---------- Crannler	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, large stones, small stones.	Severe: slope.
24G*: Crannler----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, large stones, small stones.	Severe: slope.
Rock outcrop.				
25E*. Cryaquepts				

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
26F*. Cryumbrepts				
27C---------- Debenger	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
27D---------- Debenger	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
28F*, 29F*: Dubakella----------	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
Pearsoll----------	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: large stones, slope.
30*. Dumps				
31D---------- Eightlar	Severe: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones, slope, small stones.	Severe: large stones.
31E---------- Eightlar	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
32F*, 33F*: Eightlar----------	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
Dubakella----------	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
34---------- Evans	Severe: floods.	Moderate: dusty.	Moderate: floods, dusty.	Moderate: dusty.
35F*, 36F*: Fantz----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.
Knapke----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
37G*: Fantz----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.
Rock outcrop.				
38A---------- Foehlin	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: dusty.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
38C---------- Foehlin	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: slope, small stones.	Moderate: dusty.
39D---------- Goodwin	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Severe: small stones.
40F, 41F---------- Goodwin	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Severe: slope, small stones.
42B---------- Holland	Slight----------	Slight----------	Moderate: slope, small stones.	Severe: erodes easily.
42C---------- Holland	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
42D---------- Holland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
42E---------- Holland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
43E, 44F, 45F--------- Jayar	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
46---------- Jerome	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.
47E, 48F---------- Josephine	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
49D---------- Jumpoff	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
49E, 50F, 51F--------- Jumpoff	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
52---------- Kerby	Moderate: dusty.	Moderate: dusty.	Moderate: small stones, dusty.	Moderate: dusty.
53B---------- Manita	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.
53C---------- Manita	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
53D---------- Manita	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
53E, 54F, 55F--------- Manita	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
56F---------- McMullin	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.
57---------- Newberg	Severe: floods.	Slight----------	Moderate: floods.	Slight.
58F*, 58G*: Pearsoll----------	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: large stones, slope.
Rock outcrop.				
59F, 60F---------- Perdin	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.
61B---------- Pollard	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.
61C---------- Pollard	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
61D---------- Pollard	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
61E---------- Pollard	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
62F---------- Pollard	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
63F*: Pollard----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Beekman----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
64*. Riverwash				
65F*, 66F*: Rogue----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Goodwin----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Severe: slope, small stones.
67B---------- Ruch	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: dusty.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
67C---------- Ruch	Moderate: slope, small stones, dusty.	Moderate: slope, small stones, dusty.	Severe: slope, small stones.	Moderate: dusty.
68B---------- Selmac	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Moderate: wetness, dusty.
68D---------- Selmac	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Moderate: wetness, dusty.
69E, 70F, 71F--------- Siskiyou	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
72F*: Speaker----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Josephine----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
73---------- Takilma	Moderate: large stones, dusty.	Moderate: large stones, dusty.	Severe: large stones.	Moderate: large stones, dusty.
74---------- Takilma Variant	Severe: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones, small stones.
75F, 76F---------- Tethrick	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
77E, 78F---------- Vannoy	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
79F*: Vannoy----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
Voorhies----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
80G*, 81G*: Vermisa----------	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones.
Beekman----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
82G*: Vermisa----------	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: small stones.
Rock outcrop.				

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
83-------------------- Wapato	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.
84F*: Witzel----------	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope, small stones.
Rock outcrop.				
85G-------------------- Woodseye	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.
86G*: Woodseye----------	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.
Jayar----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
87F*: Woodseye----------	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.
Rock outcrop.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1B, 1C, 1D--------- Abegg	Poor	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
2F, 3F------------- Althouse	Poor	Fair	Good	---	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
4------------------ Banning	Fair	Good	Good	Good	Fair	Good	Fair	Fair	Good	Good	Fair.
5B, 5C------------- Barron	Fair	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
6F*, 7F*: Beekman-----------	Very poor.	Very poor.	Good	Fair	Fair	Good	Very poor.	Very poor.	Very poor.	Fair	Very poor.
Colestine---------	Very poor.	Very poor.	Good	Good	Good	Good	Very poor.	Very poor.	Very poor.	Fair	Very poor.
8G*, 9G*: Beekman-----------	Very poor.	Very poor.	Good	Fair	Fair	Good	Very poor.	Very poor.	Very poor.	Fair	Very poor.
Vermisa-----------	Very poor.	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor.	Poor	Fair	Very poor.
10E---------------- Bigelow	Poor	Fair	Good	---	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
10F---------------- Bigelow	Poor	Poor	Good	---	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
11B, 11C, 12B, 12D- Brockman	Very poor.	Poor	Good	Good	Fair	Good	Poor	Very poor.	Poor	Good	Very poor.
13----------------- Brockman Variant	Poor	Fair	Good	---	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
14----------------- Camas	Fair	Fair	Fair	Poor	Poor	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.
15*: Camas-------------	Fair	Fair	Fair	Poor	Poor	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.
Newberg-----------	Good	Good	Good	Fair	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
16----------------- Central Point	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
17B---------------- Clawson	Fair	Fair	Good	Poor	Very poor.	Good	Fair	Very poor.	Fair	Good	Poor.
18A---------------- Copsey	Fair	Fair	Good	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair.
18B---------------- Copsey	Fair	Fair	Good	Fair	Fair	Good	Poor	Very poor.	Fair	Fair	Very poor.
19D*, 19E*: Cornutt----------	Very poor.	Poor	Fair	Good	Good	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for-		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
19D*, 19E*:											
Dubakella	Very poor.	Very poor.	Good	Poor	Poor	Good	Very poor.	Very poor.	Very poor.	Poor	Very poor.
20F*:											
Cornutt	Very poor.	Poor	Fair	Good	Good	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Dubakella	Very poor.	Very poor.	Good	Poor	Poor	Good	Very poor.	Very poor.	Very poor.	Poor	Very poor.
21F*:											
Cornutt	Very poor.	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Dubakella	Very poor.	Very poor.	Good	Poor	Poor	Good	Very poor.	Very poor.	Very poor.	Poor	Very poor.
22--Cove	Fair	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Poor	Good.
23G--Crannler	Very poor.	Very poor.	Poor	---	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
24G*:											
Crannler	Very poor.	Very poor.	Poor	---	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rock outcrop.											
25E*. Cryaquepts											
26F*. Cryumbrepts											
27C--Debenger	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.
27D--Debenger	Poor	Fair	Good	Good	---	Good	Very poor.	Very poor.	Poor	---	Very poor.
28F*, 29F*:											
Dubakella	Very poor.	Very poor.	Good	Poor	Poor	Good	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Pearsoll	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Poor	---	Very poor.
30*. Dumps											
31D, 31E--Eightlar	Very poor.	Very poor.	Poor	---	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
32F*, 33F*:											
Eightlar	Very poor.	Very poor.	Poor	---	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Dubakella	Very poor.	Very poor.	Good	Poor	Poor	Good	Very poor.	Very poor.	Very poor.	Poor	Very poor.
34--Evans	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
35F*, 36F*: Fantz	Very poor.	Very poor.	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Knapke	Very poor.	Very poor.	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
37G*: Fantz	Very poor.	Very poor.	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.											
38A Foehlin	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
38C Foehlin	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
39D, 40F, 41F Goodwin	Poor	Fair	Good	---	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
42B Holland	Fair	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
42C Holland	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
42D Holland	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
42E Holland	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
43E, 44F, 45F Jayar	Very poor.	Poor	Fair	Poor	Fair	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
46 Jerome	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Fair	Fair.
47E Josephine	Very poor.	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
48F Josephine	Very poor.	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
49D Jumpoff	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
49E Jumpoff	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
50F, 51F Jumpoff	Very poor.	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
52 Kerby	Good	Good	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.
53B Manita	Fair	Good	Good	Good	Good	Good	Poor	Very poor.	Fair	Fair	Very poor.
53C Manita	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
53D Manita	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
53E---------- Manita	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
54F---------- Manita	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
55F---------- Manita	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
56F---------- McMullin	Very poor.	Poor	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
57---------- Newberg	Good	Good	Good	Fair	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
58F*, 58G*: Pearsoll----------	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Poor	---	Very poor.
Rock outcrop.											
59F, 60F---------- Perdin	Very poor.	Very poor.	Fair	---	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
61B---------- Pollard	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
61C---------- Pollard	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
61D---------- Pollard	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
61E---------- Pollard	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
62F---------- Pollard	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
63F*: Pollard----------	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Beekman----------	Very poor.	Very poor.	Good	Fair	Fair	Good	Very poor.	Very poor.	Very poor.	Fair	Very poor.
64*. Riverwash											
65F*, 66F*: Rogue----------	Very poor.	Poor	Fair	---	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Goodwin----------	Poor	Fair	Good	---	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
67B---------- Ruch	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
67C---------- Ruch	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
68B---------- Selmac	Fair	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
68D---------- Selmac	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
69E---------- Siskiyou	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
70F, 71F---------- Siskiyou	Very poor.	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
72F*:											
Speaker----------	Very poor.	Poor	Good	Fair	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
Josephine----------	Very poor.	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
73---------- Takilma	Very poor.	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.
74---------- Takilma Variant	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
75F, 76F---------- Tethrick	Very poor.	Very poor.	Good	Good	Good	Good	Very poor.	Very poor.	Very poor.	Fair	Very poor.
77E---------- Vannoy	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
78F---------- Vannoy	Very poor.	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
79F*:											
Vannoy----------	Very poor.	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Voorhies----------	Poor	Fair	Good	Fair	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
80G*, 81G*:											
Vermisa----------	Very poor.	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor	Poor	Fair	Very poor.
Beekman----------	Very poor.	Very poor.	Good	Fair	Fair	Good	Very poor.	Very poor.	Very poor.	Fair	Very poor.
82G*:											
Vermisa----------	Very poor.	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.											
83---------- Wapato	Fair	Fair	Fair	Fair	---	Poor	Good	Good	Fair	Fair	Good.
84F*:											
Witzel----------	Very poor.	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.											
85G---------- Woodseye	Very poor.	Poor	Fair	---	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
86G*:											
Woodseye----------	Very poor.	Poor	Fair	---	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Jayar----------	Very poor.	Poor	Fair	---	Fair	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
87F*: Woodseye	Very poor.	Poor	Fair	---	Poor	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Rock outcrop.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1B Abegg	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
1C Abegg	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
1D Abegg	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
2F, 3F Althouse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
4 Banning	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.
5B Barron	Slight	Slight	Slight	Moderate: slope.	Slight.
5C Barron	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
6F*, 7F*: Beekman	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Colestine	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
8G*, 9G*: Beekman	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Vermisa	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
10E, 10F Bigelow	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
11B Brockman	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
11C Brockman	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
12B Brockman	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
12D Brockman	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
13 Brockman Variant	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.
14 Camas	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
15*:					
Camas	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Newberg	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
16--- Central Point	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight.
17B--- Clawson	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.
18A, 18B--- Copsey	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.
19D*:					
Cornutt	Moderate: too clayey, large stones, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
Dubakella	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, low strength, slope.
19E*, 20F*, 21F*:					
Cornutt	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Dubakella	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
22--- Cove	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.
23G--- Crannler	Severe: depth to rock, large stones, slope.	Severe: slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
24G*:					
Crannler	Severe: depth to rock, large stones, slope.	Severe: slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Rock outcrop.					
25E*. Cryaquepts					
26F*. Cryumbrepts					
27C--- Debenger	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: low strength, slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
27D---------- Debenger	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
28F*, 29F*: Dubakella---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Pearsoll---------	Severe: depth to rock, large stones, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.
30*. Dumps					
31D---------- Eightlar	Severe: large stones.	Severe: shrink-swell, large stones.	Severe: shrink-swell, large stones.	Severe: shrink-swell, slope, large stones.	Severe: low strength, shrink-swell.
31E---------- Eightlar	Severe: large stones, slope.	Severe: shrink-swell, slope, large stones.	Severe: slope, shrink-swell, large stones.	Severe: shrink-swell, slope, large stones.	Severe: low strength, slope, shrink-swell.
32F*, 33F*: Eightlar---------	Severe: large stones, slope.	Severe: shrink-swell, slope, large stones.	Severe: slope, shrink-swell, large stones.	Severe: shrink-swell, slope, large stones.	Severe: low strength, slope, shrink-swell.
Dubakella---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
34---------- Evans	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
35F*, 36F*: Fantz----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Knapke----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
37G*: Fantz----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
38A---------- Foehlin	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
38C---------- Foehlin	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.
39D, 40F, 41F----- Goodwin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
42B---------- Holland	Slight----------	Moderate: shrink-swell.	Slight----------	Moderate: shrink-swell, slope.	Moderate: shrink-swell.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
42C---------- Holland	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, shrink-swell.
42D, 42E---------- Holland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
43E, 44F, 45F----- Jayar	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
46---------- Jerome	Severe: wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness.
47E, 48F---------- Josephine	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
49D---------- Jumpoff	Moderate: too clayey, slope, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
49E, 50F, 51F----- Jumpoff	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
52---------- Kerby	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight.
53B---------- Manita	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
53C---------- Manita	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
53D, 53E, 54F, 55F---------- Manita	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
56F---------- McMullin	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
57---------- Newberg	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
58F*, 58G*: Pearsoll---------	Severe: depth to rock, large stones, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.
Rock outcrop.					
59F, 60F---------- Perdin	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
61B---------- Pollard	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
61C---------- Pollard	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
61D, 61E, 62F----- Pollard	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
63F*: Pollard----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Beekman----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
64*. Riverwash					
65F*, 66F*: Rogue----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Goodwin----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
67B---------- Ruch	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.
67C---------- Ruch	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, shrink-swell.
68B---------- Selmac	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
68D---------- Selmac	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
69E, 70F, 71F----- Siskiyou	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
72F*: Speaker----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Josephine--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
73---------- Takilma	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.
74---------- Takilma Variant	Severe: large stones, cutbanks cave.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.
75F, 76F---------- Tethrick	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
77E, 78F---------- Vannoy	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
79F*:					
Vannoy	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
Voorhies	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
80G*, 81G*:					
Vermisa	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Beekman	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
82G*:					
Vermisa	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Rock outcrop.					
83 Wapato	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.
84F*:					
Witzel	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.
Rock outcrop.					
85G Woodseye	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
86G*:					
Woodseye	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Jayar	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
87F*:					
Woodseye	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Rock outcrop.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1B Abegg	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Poor: small stones.
1C Abegg	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Poor: small stones.
1D Abegg	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: small stones, slope.
2F, 3F Althouse	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
4 Banning	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
5B Barron	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
5C Barron	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
6F*, 7F*: Beekman	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Colestine	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
8G*, 9G*: Beekman	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Vermisa	Severe: depth to rock.	Severe: seepage, depth to rock, large stones.	Severe: depth to rock, seepage, large stones.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones.
10E, 10F Bigelow	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
11B Brockman	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, large stones.
11C Brockman	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, large stones.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
12B Brockman	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, large stones.
12D Brockman	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, large stones.
13 Brockman Variant	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Poor: small stones.
14 Camas	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: seepage, too sandy, small stones.
15*: Camas	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: seepage, too sandy, small stones.
Newberg	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: too sandy.
16 Central Point	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Good.
17B Clawson	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
18A, 18B Copsey	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, small stones.
19D*: Cornutt	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack, large stones.
Dubakella	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.
19E*, 20F*, 21F*: Cornutt	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, large stones.
Dubakella	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
22 Cove	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
23G Crannler	Severe: depth to rock, slope, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope, depth to rock.	Poor: large stones, slope, area reclaim.
24G*: Crannler	Severe: depth to rock, slope, large stones.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope, depth to rock.	Poor: large stones, slope, area reclaim.
Rock outcrop.					
25E*. Cryaquepts					
26F*. Cryumbrepts					
27C Debenger	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
27D Debenger	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
28F*, 29F*: Dubakella	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
Pearsoll	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
30*. Dumps					
31D Eightlar	Severe: percs slowly, large stones.	Severe: slope, large stones.	Severe: too clayey, large stones.	Moderate: slope.	Poor: too clayey, hard to pack, large stones.
31E Eightlar	Severe: percs slowly, slope, large stones.	Severe: slope, large stones.	Severe: slope, too clayey, large stones.	Severe: slope.	Poor: too clayey, hard to pack, large stones.
32F*, 33F*: Eightlar	Severe: percs slowly, slope, large stones.	Severe: slope, large stones.	Severe: slope, too clayey, large stones.	Severe: slope.	Poor: too clayey, hard to pack, large stones.
Dubakella	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
34 Evans	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
35F*, 36F*: Fantz	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Knapke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
37G*: Fantz	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
38A Foehlin	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Poor: small stones.
38C Foehlin	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Poor: small stones.
39D, 40F, 41F Goodwin	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope, seepage, small stones.
42B Holland	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: area reclaim, thin layer.
42C Holland	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: slope, area reclaim, thin layer.
42D, 42E Holland	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
43E, 44F, 45F Jayar	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
46 Jerome	Severe: wetness, percs slowly.	Severe: wetness, seepage.	Severe: wetness.	Severe: wetness, seepage.	Poor: wetness, thin layer.
47E, 48F Josephine	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
49D Jumpoff	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: depth to rock, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
49E, 50F, 51F Jumpoff	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: depth to rock, wetness, slope.	Severe: wetness, slope.	Poor: too clayey, slope, hard to pack.
52 Kerby	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Slight	Fair: small stones, thin layer.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
53B---------- Manita	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey.
53C---------- Manita	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey.
53D, 53E, 54F, 55F-- Manita	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, slope.
56F---------- McMullin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
57---------- Newberg	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: too sandy.
58F*, 58G*: Pearsoll---------- Rock outcrop.	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
59F, 60F---------- Perdin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.
61B---------- Pollard	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey, hard to pack.
61C---------- Pollard	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, hard to pack, slope.
61D, 61E, 62F------- Pollard	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
63F*: Pollard---------- Beekman----------	Severe: percs slowly, slope. Severe: depth to rock, slope.	Severe: slope. Severe: depth to rock, slope.	Severe: slope. Severe: depth to rock, slope.	Severe: slope. Severe: depth to rock, slope.	Poor: slope. Poor: area reclaim, small stones, slope.
64*. Riverwash					
65F*, 66F*: Rogue----------	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
65F*, 66F*: Goodwin	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope, seepage, small stones.
67B Ruch	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
67C Ruch	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
68B Selmac	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
68D Selmac	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
69E, 70F, 71F Siskiyou	Severe: slope, depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: slope, area reclaim, thin layer.
72F*: Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Josephine	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
73 Takilma	Severe: poor filter.	Severe: seepage, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: seepage, small stones.
74 Takilma Variant	Severe: poor filter, large stones.	Severe: seepage, large stones.	Severe: seepage, large stones, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
75F, 76F Tethrick	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
77E, 78F Vannoy	Severe: depth to rock, percs slowly, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
79F*: Vannoy	Severe: depth to rock, percs slowly, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Voorhies	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
80G*, 81G*: Vermisa	Severe: depth to rock.	Severe: seepage, depth to rock, large stones.	Severe: depth to rock, seepage, large stones.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones.
Beekman	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
82G*: Vermisa	Severe: depth to rock.	Severe: seepage, depth to rock, large stones.	Severe: depth to rock, seepage, large stones.	Severe: depth to rock, seepage.	Poor: area reclaim, small stones.
Rock outcrop.					
83--- Wapato	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
84F*: Witzel	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
85G--- Woodseye	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, seepage, small stones.
86G*: Woodseye	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, seepage, small stones.
Jayar	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
87F*: Woodseye	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, seepage, small stones.
Rock outcrop.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions o "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1B, 1C---------- Abegg	Good----------	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, area reclaim.
1D---------- Abegg	Fair: slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, slope, area reclaim.
2F, 3F---------- Althouse	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
4---------- Banning	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
5B---------- Barron	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
5C---------- Barron	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
6F*, 7F*: Beekman----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Colestine----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
8G*, 9G*: Beekman----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Vermisa----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
10E---------- Bigelow	Fair: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
10F---------- Bigelow	Poor: slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
11B, 11C, 12B, 12D---- Brockman	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
13---------- Brockman Variant	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
14---------- Camas	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
15*: Camas	Good	Probable	Probable	Poor: small stones, area reclaim.
Newberg	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, thin layer.
16 Central Point	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
17B Clawson	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
18A, 18B Copsey	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
19D*: Cornutt	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
Dubakella	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
19E*, 20F*, 21F*: Cornutt	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
Dubakella	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
22 Cove	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
23G Crannler	Poor: large stones, area reclaim, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, slope.
24G*: Crannler	Poor: large stones, area reclaim, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, slope.
Rock outcrop.				
25E*. Cryaquepts				
26F*. Cryumbrepts				
27C Debenger	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope, small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
27D---------- Debenger	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
28F*, 29F*: Dubakella----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Pearsoll----------	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
30*. Dumps				
31D---------- Eightlar	Poor: low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: too clayey, large stones, area reclaim.
31E---------- Eightlar	Poor: low strength, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: too clayey, large stones, area reclaim.
32F*, 33F*: Eightlar----------	Poor: low strength, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: too clayey, large stones, area reclaim.
Dubakella----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
34---------- Evans	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
35F*, 36F*: Fantz----------	Poor: area reclaim, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
Knapke----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
37G*: Fantz----------	Poor: area reclaim, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
Rock outcrop.				
38A, 38C---------- Foehlin	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
39D---------- Goodwin	Fair: slope, area reclaim, thin layer.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, slope, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
40F, 41F Goodwin	Poor: slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, slope, area reclaim.
42B Holland	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
42C Holland	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
42D Holland	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
42E Holland	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
43E, 44F, 45F Jayar	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
46 Jerome	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
47E, 48F Josephine	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
49D Jumpoff	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
49E, 50F, 51F Jumpoff	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
52 Kerby	Good	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, area reclaim.
53B, 53C Manita	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
53D Manita	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
53E, 54F, 55F Manita	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
56F McMullin	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
57 Newberg	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
58F*, 58G*:				
Pearsoll	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
59F, 60F Perdin	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
61B, 61C Pollard	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
61D Pollard	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
61E, 62F Pollard	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
63F*:				
Pollard	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Beekman	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
64*. Riverwash				
65F*, 66F*:				
Rogue	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Goodwin	Poor: slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, slope, area reclaim.
67B, 67C Ruch	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
68B, 68D Selmac	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
69E, 70F, 71F Siskiyou	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
72F*:				
Speaker	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Josephine	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
73--Takilma	Fair: large stones.	Improbable: small stones.	Probable	Poor: small stones.
74--Takilma Variant	Poor: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: small stones, area reclaim.
75F, 76F--Tethrick	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
77E, 78F--Vannoy	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
79F*:				
Vannoy	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Voorhies	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
80G*, 81G*:				
Vermisa	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Beekman	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
82G*:				
Vermisa	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Rock outcrop.				
83--Wapato	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
84F*:				
Witzel	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
85G--Woodseye	Poor: area reclaim, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
86G*:				
Woodseye	Poor: area reclaim, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
Jayar	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
87F*: Woodseye	Poor: area reclaim, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
Rock outcrop.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1B---------- Abegg	Moderate: seepage, slope.	Moderate: thin layer, large stones.	Deep to water	Droughty, slope.	Large stones	Droughty, large stones.
1C, 1D---------- Abegg	Severe: slope.	Moderate: thin layer, large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Slope, droughty, large stones.
2F, 3F---------- Althouse	Severe: slope.	Severe: seepage.	Deep to water	Slope, large stones.	Slope, large stones.	Slope, large stones.
4---------- Banning	Slight----------	Severe: wetness.	Favorable-----	Wetness--------	Wetness--------	Wetness.
5B---------- Barron	Severe: seepage.	Severe: piping.	Deep to water	Droughty, slope.	Favorable-----	Droughty.
5C---------- Barron	Severe: seepage, slope.	Severe: piping.	Deep to water	Droughty, slope.	Slope----------	Slope, droughty.
6F*, 7F*: Beekman----------	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock slope.	Slope, depth to rock	Slope, droughty, depth to rock
Colestine--------	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock	Large stones, slope, depth to rock
8G*, 9G*: Beekman----------	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock slope.	Slope, depth to rock	Slope, droughty, depth to rock
Vermisa----------	Severe: depth to rock.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock	Large stones, depth to rock	Large stones, droughty, depth to rock
10E, 10F---------- Bigelow	Severe: slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
11B---------- Brockman	Moderate: slope.	Moderate: hard to pack, large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Large stones, wetness.	Large stones, droughty.
11C---------- Brockman	Severe: slope.	Moderate: hard to pack, large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Slope, large stones, wetness.	Large stones, slope, droughty.
12B---------- Brockman	Moderate: slope.	Moderate: hard to pack, large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Large stones, wetness.	Large stones, droughty.
12D---------- Brockman	Severe: slope.	Moderate: hard to pack, large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Slope, large stones, wetness.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
13---------- Brockman Variant	Moderate: seepage.	Severe: piping.	Deep to water	Favorable-----	Favorable-----	Favorable.
14---------- Camas	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, floods.	Large stones, too sandy.	Large stones, droughty.
15*: Camas----------	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, floods.	Large stones, too sandy.	Large stones, droughty.
Newberg----------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Floods--------	Too sandy-----	Favorable.
16---------- Central Point	Severe: seepage.	Severe: piping.	Deep to water	Droughty------	Favorable-----	Droughty.
17B---------- Clawson	Severe: seepage.	Severe: piping, wetness.	Slope---------	Wetness, slope.	Wetness-------	Wetness.
18A---------- Copsey	Slight---------	Severe: wetness.	Percs slowly	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
18B---------- Copsey	Moderate: slope.	Severe: wetness.	Percs slowly, slope.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
19D*, 19E*, 20F*, 21F*: Cornutt---------	Severe: slope.	Severe: thin layer, hard to pack, large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, percs slowly.	Large stones, slope, droughty.
Dubakella--------	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock	Large stones, slope, droughty.
22---------- Cove	Slight---------	Severe: hard to pack, wetness.	Percs slowly, floods.	Wetness, droughty.	Wetness, percs slowly.	Wetness, droughty, percs slowly.
23G---------- Crannler	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock	Large stones, slope, depth to rock	Large stones, slope, droughty.
24G*: Crannler---------	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock	Large stones, slope, depth to rock	Large stones, slope, droughty.
Rock outcrop.						
25E*. Cryaquepts						
26F*. Cryumbrepts						
27C, 27D---------- Debenger	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock	Slope, depth to rock
28F*, 29F*: Dubakella--------	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock	Large stones, slope, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
28F*, 29F*: Pearsoll	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Large stones, slope, depth to rock	Large stones, slope, droughty.
30*. Dumps						
31D, 31E--- Eightlar	Severe: slope.	Severe: hard to pack, large stones.	Deep to water	Large stones, droughty, slow intake.	Slope, large stones, percs slowly.	Large stones, slope, droughty.
32F*, 33F*: Eightlar	Severe: slope.	Severe: hard to pack, large stones.	Deep to water	Large stones, droughty, slow intake.	Slope, large stones, percs slowly.	Large stones, slope, droughty.
Dubakella	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock	Large stones, slope, droughty.
34--- Evans	Moderate: seepage.	Severe: piping.	Deep to water	Floods	Erodes easily	Erodes easily.
35F*, 36F*: Fantz	Severe: slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
Knapke	Severe: slope.	Severe: seepage.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
37G*: Fantz	Severe: slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
Rock outcrop.						
38A--- Foehlin	Slight	Slight	Deep to water	Favorable	Favorable	Favorable.
38C--- Foehlin	Moderate: slope.	Slight	Deep to water	Slope	Favorable	Favorable.
39D, 40F, 41F--- Goodwin	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
42B--- Holland	Moderate: depth to rock, slope.	Severe: piping.	Deep to water	Slope, erodes easily	Erodes easily	Erodes easily.
42C, 42D, 42E--- Holland	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily	Slope, erodes easily	Slope, erodes easily
43E, 44F, 45F--- Jayar	Severe: slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
46--- Jerome	Severe: seepage.	Severe: piping, wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly, erodes easily	Wetness, erodes easily percs slowly.
47E, 48F--- Josephine	Severe: slope.	Moderate: thin layer.	Deep to water	Slope	Slope	Slope.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
49D, 49E, 50F, 51F Jumpoff	Severe: slope.	Moderate: thin layer, hard to pack, large stones.	Percs slowly, slope.	Slope, percs slowly, wetness.	Slope, large stones, wetness.	Large stones, slope, percs slowly.
52 Kerby	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
53B Manita	Moderate: depth to rock, slope.	Moderate: thin layer.	Deep to water	Slope	Favorable	Favorable.
53C, 53D, 53E, 54F, 55F Manita	Severe: slope.	Moderate: thin layer.	Deep to water	Slope	Slope	Slope.
56F McMullin	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock	Large stones, slope, depth to rock
57 Newberg	Severe: seepage.	Severe: seepage, piping.	Deep to water	Floods	Too sandy	Favorable.
58F*, 58G*: Pearsoll	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Large stones, slope, depth to rock	Large stones, slope, droughty.
Rock outcrop.						
59F, 60F Perdin	Severe: slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock slope.	Slope, large stones, depth to rock	Large stones, slope, depth to rock
61B Pollard	Moderate: slope.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, slope.	Percs slowly	Droughty, percs slowly.
61C, 61D, 61E, 62F Pollard	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, slope.	Slope, percs slowly.	Slope, droughty, percs slowly.
63F*: Pollard	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, slope.	Slope, percs slowly.	Slope, droughty, percs slowly.
Beekman	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock slope.	Slope, depth to rock	Slope, droughty, depth to rock
64*. Riverwash						
65F*, 66F*: Rogue	Severe: seepage, slope.	Moderate: thin layer, seepage, piping.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Goodwin	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
67B---------- Ruch	Moderate: slope.	Slight----------	Deep to water	Slope----------	Erodes easily	Erodes easily.
67C---------- Ruch	Severe: slope.	Slight----------	Deep to water	Slope----------	Slope, erodes easily	Slope, erodes easily
68B---------- Selmac	Moderate: slope.	Severe: hard to pack, wetness.	Percs slowly, slope.	Wetness, droughty, percs slowly.	Wetness, percs slowly.	Droughty, percs slowly.
68D---------- Selmac	Severe: slope.	Severe: hard to pack, wetness.	Percs slowly, slope.	Wetness, droughty, percs slowly.	Slope, wetness, percs slowly.	Slope, droughty, percs slowly.
69E, 70F, 71F----- Siskiyou	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock slope.	Slope, depth to rock	Slope, droughty, depth to rock
72F*: Speaker----------	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock	Slope, depth to rock
Josephine--------	Severe: slope.	Moderate: thin layer.	Deep to water	Slope----------	Slope----------	Slope.
73---------- Takilma	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones, droughty.	Large stones	Large stones, droughty.
74---------- Takilma Variant	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones, droughty.	Large stones, too sandy.	Large stones, droughty.
75F, 76F---------- Tethrick	Severe: slope.	Severe: piping.	Deep to water	Slope----------	Slope, erodes easily	Slope, erodes easily
77E, 78F---------- Vannoy	Severe: slope.	Severe: thin layer.	Deep to water	Slope, erodes easily depth to rock	Slope, depth to rock erodes easily	Slope, depth to rock erodes easily
79F*: Vannoy----------	Severe: slope.	Severe: thin layer.	Deep to water	Slope, erodes easily depth to rock	Slope, depth to rock erodes easily	Slope, depth to rock erodes easily
Voorhies----------	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
80G*, 81G*: Vermisa----------	Severe: depth to rock.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock	Large stones, depth to rock	Large stones, droughty, depth to rock
Beekman----------	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock slope.	Slope, depth to rock	Slope, droughty, depth to rock
82G*: Vermisa----------	Severe: depth to rock.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock	Large stones, depth to rock	Large stones, droughty, depth to rock
Rock outcrop.						
83---------- Wapato	Slight----------	Severe: hard to pack, wetness.	Floods--------	Wetness, floods.	Wetness--------	Wetness.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
84F*: Witzel	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
Rock outcrop.						
85G Woodseye	Severe: depth to rock, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock slope.	Slope, large stones, depth to rock	Large stones, slope, droughty.
86G*: Woodseye	Severe: depth to rock, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock slope.	Slope, large stones, depth to rock	Large stones, slope, droughty.
Jayar	Severe: slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock	Slope, large stones, depth to rock	Large stones, slope, droughty.
87F*: Woodseye	Severe: depth to rock, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock slope.	Slope, large stones, depth to rock	Large stones, slope, droughty.
Rock outcrop.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1B, 1C, 1D----- Abegg	0-16	Gravelly loam----	GM, SM	A-4, A-2	0-15	55-80	50-70	40-65	30-50	25-35	NP-10
	16-56	Very gravelly clay loam, extremely gravelly loam, extremely gravelly clay loam.	GC	A-2	0-30	35-55	25-45	20-45	20-35	30-40	10-20
	56-60	Very gravelly sandy loam, very gravelly loamy sand, extremely gravelly loamy sand.	GM, GW-GM, GP-GM	A-1	15-30	25-55	15-50	10-35	5-20	---	NP
2F, 3F----- Althouse	0-3	Very gravelly silt loam.	GM	A-4, A-2	0-15	45-60	40-50	35-50	30-45	20-30	NP-5
	3-46	Very gravelly silt loam, very gravelly loam, extremely gravelly silt loam.	GM	A-1	0-30	20-40	15-35	15-30	10-25	20-30	NP-5
	46	Weathered bedrock	---	---	---	---	---	---	---	---	---
4----- Banning	0-6	Loam----------	ML	A-4	0	80-100	75-95	65-90	50-70	30-35	5-10
	6-60	Clay loam, gravelly clay loam.	CL	A-6	0	75-100	65-95	60-95	50-75	35-40	15-20
5B, 5C----- Barron	0-9	Coarse sandy loam	SM	A-2	0	90-100	85-95	50-65	25-35	---	NP
	9-60	Coarse sandy loam, sandy loam.	SM	A-2	0	90-100	85-95	50-65	25-35	---	NP
6F*, 7F*: Beekman-----	0-5	Gravelly loam----	GM, SM	A-2, A-4	0	60-85	50-75	40-70	30-50	25-30	NP-5
	5-25	Very gravelly loam, very gravelly clay loam.	GM	A-2, A-1	0	25-50	20-50	20-50	15-35	30-40	5-10
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Colestine-----	0-12	Gravelly loam----	ML, GM, SM	A-4	0	60-85	55-75	50-70	35-60	25-35	NP-10
	12-34	Gravelly loam, gravelly clay loam.	GC, CL, SC	A-6	0-25	70-80	65-80	55-75	40-65	30-40	10-15
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
8G*, 9G*: Beekman-----	0-5	Gravelly loam----	GM, SM	A-2, A-4	0	60-85	50-75	40-70	30-50	25-30	NP-5
	5-25	Very gravelly loam, very gravelly clay loam.	GM	A-2, A-1	0	25-50	20-50	20-50	15-35	30-40	5-10
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
8G*, 9G*:											
Vermisa	0-3	Extremely gravelly loam.	GM	A-1, A-2, A-4	0-25	30-55	25-50	25-50	20-45	20-30	NP-5
	3-15	Very gravelly loam, very gravelly silt loam.	GM	A-1, A-2	20-40	20-50	15-45	15-45	10-35	25-35	NP-5
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
10E, 10F	0-14	Very gravelly sandy loam.	GM	A-1	10-25	35-60	30-55	20-40	10-20	---	NP
Bigelow	14-65	Very cobbly sandy loam, very stony sandy loam, extremely stony sandy loam.	GM, SM	A-1	45-70	35-70	30-65	20-45	10-25	---	NP
11B, 11C	0-15	Clay loam	CL	A-6	0-20	90-100	75-100	75-100	60-80	35-40	15-20
Brockman	15-25	Cobbly clay, cobbly clay loam.	CL	A-7	15-30	75-95	70-90	65-90	50-85	45-50	20-25
	25-60	Cobbly clay	CH	A-7	20-30	75-85	70-80	65-80	50-75	60-70	35-40
12B, 12D	0-9	Cobbly clay loam	CL	A-6	20-40	75-100	70-100	65-100	50-80	35-40	15-20
Brockman	9-16	Cobbly clay, cobbly clay loam.	CL	A-7	15-30	75-95	70-90	65-90	50-85	45-50	20-25
	16-60	Cobbly clay	CH	A-7	20-30	75-85	70-80	65-80	50-75	60-70	35-40
13	0-12	Very gravelly loam.	GM, SM	A-2	0-10	55-70	40-50	35-50	25-35	30-35	5-10
Brockman Variant	12-62	Gravelly clay loam, gravelly loam, very gravelly loam.	GM, ML, SM	A-4, A-6	10-15	65-85	60-85	50-80	35-70	30-40	5-15
14	0-10	Gravelly sandy loam.	GM, SM	A-1	0-25	60-70	50-70	25-50	15-25	---	NP
Camas	10-60	Very gravelly coarse sand, very gravelly sand, very gravelly loamy sand.	GP	A-1	5-25	25-50	15-40	10-20	0-5	---	NP
15*:											
Camas	0-10	Gravelly sandy loam.	GM, SM	A-1	0-25	60-70	50-70	25-50	15-25	---	NP
	10-60	Very gravelly coarse sand, very gravelly sand, very gravelly loamy sand.	GP	A-1	5-25	25-50	15-40	10-20	0-5	---	NP
Newberg	0-15	Fine sandy loam	SM	A-4, A-2	0	100	100	60-85	30-50	---	NP
	15-24	Sandy loam, fine sandy loam, coarse sandy loam.	SM	A-2, A-4	0	75-100	75-100	40-85	25-50	---	NP
	24-61	Loamy sand, loamy fine sand, fine sand.	SM	A-1, A-2, A-4	0-10	80-100	80-100	45-85	15-40	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
16---------- Central Point	0-15	Sandy loam-------	SM, ML	A-4, A-2	0	85-100	75-100	55-85	30-65	20-30	NP-5
	15-36	Sandy loam-------	SM	A-4, A-2, A-1	0	85-100	75-100	40-70	20-40	---	NP
	36-60	Gravelly sandy loam, gravelly loamy sand.	SM	A-2, A-1	0	95-100	55-75	30-55	10-20	---	NP
17B---------- Clawson	0-3	Sandy loam-------	SM	A-2, A-4	0	100	100	60-70	30-40	---	NP
	3-46	Sandy loam, coarse sandy loam.	SM	A-2, A-4	0	100	90-100	55-70	25-40	---	NP
	46-60	Loamy sand, coarse sandy loam, loam.	SM, ML	A-2, A-4	0	100	90-100	50-90	20-60	---	NP
18A, 18B---------- Copsey	0-18	Clay-------------	CH	A-7	0	80-100	75-100	65-100	55-95	50-65	25-35
	18-40	Gravelly clay----	CH	A-7	0-15	60-85	55-75	50-75	50-70	50-65	25-35
	40-60	Stratified gravelly clay loam to gravelly clay.	CL, CH	A-7	5-15	65-85	60-75	55-75	50-70	40-55	15-30
19D*, 19E*, 20F*, 21F*:											
Cornutt---------	0-11	Cobbly clay loam	CL	A-6, A-7	15-30	80-95	75-90	65-90	50-70	35-45	15-25
	11-41	Clay, cobbly clay, gravelly clay.	CH, CL	A-7	0-30	75-90	70-85	65-85	50-80	45-60	25-35
	41	Weathered bedrock	---	---	---	---	---	---	---	---	---
Dubakella------	0-7	Very cobbly clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	25-40	85-95	70-85	60-70	40-60	25-40	5-15
	7-28	Very cobbly clay loam, very gravelly clay, extremely cobbly clay.	GC, SC	A-7	10-30	50-75	35-60	35-60	35-50	40-55	15-30
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
22---------- Cove	0-8	Silty clay loam	CL	A-6	0	100	100	95-100	80-95	30-40	10-20
	8-60	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	60-80	40-50
23G---------- Crannler	0-4	Very stony sandy loam.	GM, SM	A-1, A-2	25-50	40-75	35-70	20-50	10-30	---	NP
	4-32	Extremely stony sandy loam.	GM, SM	A-1	50-75	35-70	30-60	20-40	10-25	---	NP
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
24G*: Crannler---------	0-4	Very stony sandy loam.	GM, SM	A-1, A-2	25-50	40-75	35-70	20-50	10-30	---	NP
	4-32	Extremely stony sandy loam.	GM, SM	A-1	50-75	35-70	30-60	20-40	10-25	---	NP
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
25E*. Cryaquepts											
26F*. Cryumbrepts											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
27C, 27D---------- Debenger	0-11	Loam----------	ML	A-4	0	80-100	75-100	65-95	50-70	20-30	NP-5
	11-28	Clay loam, loam	CL, CL-ML	A-4, A-6	0	80-100	75-100	65-100	50-80	25-40	5-15
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
28F*, 29F*: Dubakella-------	0-7	Very cobbly clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	25-40	85-95	70-85	60-70	40-60	25-40	5-15
	7-28	Very cobbly clay loam, very gravelly clay, extremely cobbly clay.	GC, SC	A-7	10-30	50-75	35-60	35-60	35-50	40-55	15-30
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pearsoll--------	0-5	Extremely stony clay loam.	GC, CL	A-7	40-70	50-80	45-75	40-75	35-65	40-50	20-25
	5-14	Extremely cobbly clay.	GC, CH	A-7	40-75	45-75	40-70	40-70	35-65	50-65	25-35
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
30*. Dumps											
31D, 31E---------- Eightlar	0-10	Extremely stony clay.	GC, CH	A-7	25-65	50-85	45-80	40-80	35-75	55-70	30-40
	10-61	Extremely stony clay, very stony clay.	GC, CH	A-2, A-7	35-70	40-65	35-60	30-60	25-55	60-75	35-45
32F*, 33F*: Eightlar--------	0-10	Extremely stony clay.	GC, CH	A-7	25-65	50-85	45-80	40-80	35-75	55-70	30-40
	10-61	Extremely stony clay, very stony clay.	GC, CH	A-2, A-7	35-70	40-65	35-60	30-60	25-55	60-75	35-45
Dubakella----------	0-7	Very cobbly clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	25-40	85-95	70-85	60-70	40-60	25-40	5-15
	7-28	Very cobbly clay loam, very gravelly clay, extremely cobbly clay.	GC, SC	A-7	10-30	50-75	35-60	35-60	35-50	40-55	15-30
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
34---------- Evans	0-9	Loam----------	ML	A-4	0	95-100	90-100	75-95	55-75	---	NP
	9-64	Loam, silt loam, very fine sandy loam.	ML	A-4	0	95-100	90-100	75-95	50-75	---	NP
35F*, 36F*: Fantz----------	0-12	Very gravelly loam.	GM	A-2, A-1	0-15	40-55	35-50	30-45	20-35	25-30	NP-5
	12-29	Extremely cobbly loam.	GM	A-2, A-1	25-60	30-55	25-50	20-45	15-35	25-35	NP-10
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Knapke----------	0-13	Extremely gravelly loam.	GM	A-1, A-2	10-30	20-50	15-45	15-40	10-35	25-30	NP-5
	13-62	Extremely gravelly loam.	GM	A-1, A-2	10-25	20-50	15-45	15-40	10-35	25-35	NP-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
37G*:											
Fantz	0-12	Very gravelly loam.	GM	A-2, A-1	0-15	40-55	35-50	30-45	20-35	25-30	NP-5
	12-29	Extremely cobbly loam.	GM	A-2, A-1	25-60	30-55	25-50	20-45	15-35	25-35	NP-10
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
38A, 38C	0-13	Gravelly loam	ML, GM, SM	A-4	0	60-90	55-75	50-70	40-55	30-35	5-10
Foehlin	13-66	Gravelly clay loam, clay loam.	CL, GC, SC	A-6	0-10	60-90	55-85	50-85	40-70	35-40	15-20
39D, 40F, 41F	0-16	Very stony sandy loam.	GM	A-1	10-30	30-60	25-55	15-40	10-25	---	NP
Goodwin	16-55	Extremely gravelly sandy loam, very gravelly loam, very gravelly sandy loam.	GM, GP-GM	A-1, A-2	10-50	25-60	20-55	10-40	5-30	---	NP
	55	Weathered bedrock	---	---	---	---	---	---	---	---	---
42B, 42C, 42D, 42E	0-14	Sandy loam	SM	A-4	0	90-100	85-100	65-75	35-45	---	NP
Holland	14-28	Sandy clay loam	SC	A-6	0	90-100	85-100	65-80	35-50	30-35	10-15
	28-49	Sandy loam, sandy clay loam.	SM	A-4	0	90-100	85-100	65-80	35-50	25-35	NP-10
	49	Weathered bedrock	---	---	---	---	---	---	---	---	---
43E, 44F, 45F	0-3	Very gravelly loam.	GM	A-1, A-2	0-40	25-55	20-50	15-45	10-35	---	NP
Jayar	3-31	Extremely gravelly loam, very gravelly clay loam, very gravelly loam.	GM	A-1, A-2	0-45	25-55	20-50	15-45	10-35	30-40	NP-10
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
46	0-10	Sandy loam	SM	A-2, A-4	0	95-100	95-100	55-70	30-40	---	NP
Jerome	10-35	Sandy loam, loam	SM, ML	A-2, A-4	0	80-100	75-100	50-80	25-60	---	NP
	35-64	Clay, silty clay	CH	A-7	0	95-100	95-100	85-100	70-95	50-65	25-40
47E, 48F	0-9	Gravelly loam	SM, GM	A-7	0	60-80	50-75	35-60	35-50	40-45	10-15
Josephine	9-59	Clay loam, gravelly clay loam.	CL, GC, SC	A-7	0	65-100	50-100	45-85	40-75	40-45	15-20
	59	Weathered bedrock	---	---	---	---	---	---	---	---	---
49D, 49E, 50F, 51F	0-18	Clay loam	ML, CL	A-6, A-7	0-15	80-100	75-100	70-95	50-80	35-45	10-20
Jumpoff	18-55	Clay, cobbly clay	CH	A-7	0-25	80-100	75-100	70-100	55-95	50-60	25-30
	55	Weathered bedrock	---	---	---	---	---	---	---	---	---
52	0-7	Loam	ML, SM	A-4	0-5	85-100	75-100	65-95	45-75	20-30	NP-5
Kerby	7-40	Loam, gravelly loam.	ML, SM	A-4	0-10	75-100	65-95	55-90	40-70	25-35	NP-5
	40-60	Extremely gravelly sand, very gravelly sandy loam, extremely gravelly sandy loam.	GM, GW-GM, GP, GP-GM	A-1	0-10	20-60	15-50	10-35	0-20	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
53B, 53C, 53D, 53E, 54F, 55F---											
Manita	0-11	Loam----------	ML	A-4	0	85-100	75-100	65-95	50-75	25-35	NP-10
	11-50	Clay loam, silty clay, clay.	CL	A-7	0	85-100	75-100	65-100	55-95	40-50	20-25
	50	Weathered bedrock	---	---	---	---	---	---	---	---	---
56F----------	0-7	Gravelly loam----	SM	A-4, A-2	0-25	70-80	65-75	45-65	25-50	20-30	NP-5
McMullin	7-14	Gravelly clay loam, gravelly loam.	CL	A-6	0-25	75-95	65-75	60-75	50-60	30-40	10-15
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
57----------	0-15	Fine sandy loam	SM	A-4, A-2	0	100	100	60-85	30-50	---	NP
Newberg	15-24	Sandy loam, fine sandy loam, coarse sandy loam.	SM	A-2, A-4	0	75-100	75-100	40-85	25-50	---	NP
	24-61	Loamy sand, loamy fine sand, fine sand.	SM	A-1, A-2, A-4	0-10	80-100	80-100	45-85	15-40	---	NP
58F*, 58G*:											
Pearsoll--------	0-5	Extremely stony clay loam.	GC, CL	A-7	40-70	50-80	45-75	40-75	35-65	40-50	20-25
	5-14	Extremely cobbly clay.	GC, CH	A-7	40-75	45-75	40-70	40-70	35-65	50-65	25-35
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
59F, 60F----------	0-7	Cobbly loam------	ML	A-4	15-30	75-95	70-90	70-85	55-70	30-35	5-10
Perdin	7-24	Gravelly clay loam, gravelly clay.	CL	A-7	0-15	70-80	65-75	60-75	50-65	40-50	20-25
	24	Weathered bedrock	---	---	---	---	---	---	---	---	---
61B, 61C, 61D, 61E----------	0-3	Loam----------	ML	A-6	0-15	85-95	85-95	70-80	60-70	35-40	10-15
Pollard	3-60	Clay, silty clay, clay loam.	MH, ML	A-7	0	90-100	75-100	70-95	65-90	45-55	15-20
62F----------	0-20	Gravelly loam----	SM, ML	A-6	0-15	75-85	65-75	55-70	40-55	35-40	10-15
Pollard	20-60	Clay, silty clay, clay loam.	MH, ML	A-7	0	90-100	75-100	70-95	65-90	45-55	15-20
63F*:											
Pollard----------	0-20	Gravelly loam----	SM, ML	A-6	0-15	75-85	65-75	55-70	40-55	35-40	10-15
	20-60	Clay, silty clay, clay loam.	MH, ML	A-7	0	90-100	75-100	70-95	65-90	45-55	15-20
Beekman----------	0-5	Gravelly loam----	GM, SM	A-2, A-4	0	60-85	50-75	40-70	30-50	25-30	NP-5
	5-25	Very gravelly loam, very gravelly clay loam.	GM	A-2, A-1	0	25-50	20-50	20-50	15-35	30-40	5-10
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
64*. Riverwash											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
65F*, 66F*:											
Rogue	0-4	Stony coarse sandy loam.	SM	A-1, A-2	10-30	80-90	70-80	40-55	20-30	---	NP
	4-30	Cobbly coarse sandy loam, gravelly coarse sandy loam.	SM	A-1, A-2	0-30	80-90	70-80	40-55	20-30	---	NP
	30-56	Coarse sandy loam, gravelly coarse sandy loam, gravelly loamy coarse sand.	SM	A-1, A-2	0	75-100	60-100	35-75	10-35	---	NP
	56	Weathered bedrock	---	---	---	---	---	---	---	---	---
Goodwin	0-16	Very stony sandy loam.	GM	A-1	10-30	30-60	25-55	15-40	10-25	---	NP
	16-55	Extremely gravelly sandy loam, very gravelly loam, very gravelly sandy loam.	GM, GP-GM	A-1, A-2	10-50	25-60	20-55	10-40	5-30	---	NP
	55	Weathered bedrock	---	---	---	---	---	---	---	---	---
67B, 67C	0-5	Gravelly silt loam.	ML, CL-ML, SM, GM	A-4	0	70-90	60-75	50-75	40-65	25-35	5-10
Ruch	5-60	Gravelly clay loam, clay loam, gravelly loam.	CL	A-6	0-10	75-100	65-95	60-85	50-70	30-40	15-20
68B, 68D	0-6	Loam	ML	A-4	0	80-100	75-95	65-90	50-70	30-35	5-10
Selmac	6-18	Clay loam, gravelly clay loam.	CL	A-6	0-15	70-90	65-85	60-85	50-70	35-40	15-20
	18-60	Clay	CH	A-7	0	95-100	95-100	85-100	70-95	60-75	40-50
69E, 70F, 71F	0-4	Gravelly sandy loam.	SM	A-2, A-1	0	85-100	60-75	35-55	15-30	---	NP
Siskiyou	4-36	Gravelly coarse sandy loam, sandy loam, gravelly sandy loam.	SM	A-2, A-1	0-15	75-100	60-85	35-65	15-35	---	NP
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
72F*:											
Speaker	0-13	Gravelly loam	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	13-30	Gravelly clay loam, loam, gravelly loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
Josephine	0-13	Gravelly loam	SM, GM	A-7	0	60-80	50-75	35-60	35-50	40-45	10-15
	13-41	Clay loam, gravelly clay loam.	CL, GC, SC	A-7	0	65-100	50-100	45-85	40-75	40-45	15-20
	41	Weathered bedrock	---	---	---	---	---	---	---	---	---
73	0-6	Cobbly loam	ML, SM	A-4	25-40	75-90	75-85	60-80	45-65	25-35	NP-5
Takilma	6-18	Very gravelly clay loam, very cobbly loam.	GM	A-4, A-2	25-45	50-65	45-65	40-65	25-50	25-35	NP-10
	18-60	Extremely cobbly sandy loam, very cobbly sandy loam, very cobbly loam.	GM, GW-GM, GP-GM	A-1, A-2	15-50	25-50	20-50	15-35	5-30	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
74----------	0-18	Extremely cobbly loam.	GM	A-1, A-2	40-55	30-45	20-35	15-35	10-25	25-35	NP-10
Takilma Variant	18-28	Extremely cobbly sandy clay loam, extremely cobbly loam.	GM, GP-GM	A-1, A-2	40-55	25-45	20-35	15-30	5-25	25-35	NP-10
	28-63	Extremely cobbly loamy coarse sand, extremely cobbly sand.	GW-GM, GW, GP-GM	A-1	45-65	20-45	15-40	10-30	0-10	---	NP
75F, 76F---------- Tethrick	0-9	Gravelly fine sandy loam.	SM, ML	A-1, A-2, A-4	0-20	75-95	65-85	40-75	20-55	---	NP
	9-53	Fine sandy loam, sandy loam, loam.	SM, ML	A-2, A-4	0-10	90-100	80-95	50-80	30-60	---	NP
	53	Weathered bedrock	---	---	---	---	---	---	---	---	---
77E, 78F---------- Vannoy	0-7	Silt loam--------	ML	A-4	0-5	85-100	75-100	70-85	55-75	35-40	5-10
	7-29	Clay loam, gravelly clay loam.	CL	A-7	0-10	65-100	55-100	50-85	50-75	40-45	20-25
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
79F*:											
Vannoy----------	0-14	Silt loam--------	ML	A-4	0-5	85-100	75-100	70-85	55-75	35-40	5-10
	14-33	Clay loam--------	CL	A-7	0-10	90-100	90-100	75-85	60-75	40-45	20-25
	33	Weathered bedrock	---	---	---	---	---	---	---	---	---
Voorhies--------	0-15	Very gravelly loam.	GM, GM-GC	A-2, A-1	0	30-55	25-50	20-50	15-35	25-35	5-10
	15-36	Very gravelly clay loam, very cobbly clay loam, very cobbly loam.	GC	A-2, A-6	15-40	25-65	20-60	15-60	15-45	30-40	10-20
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
80G*, 81G*:											
Vermisa----------	0-3	Extremely gravelly loam.	GM	A1, A-2, A4	0-25	30-55	25-50	25-50	20-45	20-30	NP-5
	3-15	Very gravelly loam, very gravelly silt loam.	GM	A-1, A-2	20-40	20-50	15-45	15-45	10-35	25-35	NP-5
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Beekman----------	0-5	Gravelly loam-----	GM, SM	A-2, A-4	0	60-85	50-75	40-70	30-50	25-30	NP-5
	5-25	Very gravelly loam, very gravelly clay loam.	GM	A-2, A-1	0	25-50	20-50	20-50	15-35	30-40	5-10
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
82G*:											
Vermisa----------	0-3	Extremely gravelly loam.	GM	A1, A-2, A4	0-25	30-55	25-50	25-50	20-45	20-30	NP-5
	3-15	Very gravelly loam, very gravelly silt loam.	GM	A-1, A-2	20-40	20-50	15-45	15-45	10-35	25-35	NP-5
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
83----------	0-8	Silt loam--------	ML	A-4	0	100	100	95-100	75-90	30-35	5-10
Wapato	8-42	Silty clay loam	ML	A-6	0	100	100	95-100	85-95	35-40	10-15
	42-60	Silty clay-------	MH	A-7	0	100	100	95-100	90-95	50-60	10-20
84F*:											
Witzel----------	0-7	Very cobbly loam	GM	A-4, A-2	30-45	50-75	30-70	30-70	25-50	25-30	NP-5
	7-14	Very stony silty clay loam, extremely cobbly clay loam.	GC	A-6, A-2	50-60	45-75	30-65	30-60	25-50	35-40	15-20
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
85G----------	0-8	Very gravelly loam.	GM	A-1, A-2	0-5	25-60	20-50	15-45	10-30	20-35	NP-10
Woodseye	8-18	Very cobbly loam, extremely stony loam.	GP-GM, GM	A-1, A-2	30-50	30-60	20-50	15-40	5-25	20-35	NP-10
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
86G*:											
Woodseye--------	0-4	Very gravelly loam.	GM	A-1, A-2	0-5	25-60	20-50	15-45	10-30	20-35	NP-10
	4-11	Very cobbly loam, extremely stony loam, very gravelly loam.	GP-GM, GM	A-1, A-2	30-50	30-60	20-50	15-40	5-25	20-35	NP-10
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Jayar----------	0-3	Very gravelly loam.	GM	A-1, A-2	0-40	25-55	20-50	15-45	10-35	---	NP
	3-31	Extremely gravelly loam, very gravelly clay loam, very gravelly loam.	GM	A-1, A-2	0-45	25-55	20-50	15-45	10-35	30-40	NP-10
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
87F*:											
Woodseye--------	0-8	Very gravelly loam.	GM	A-1, A-2	0-5	25-60	20-50	15-45	10-30	20-35	NP-10
	8-18	Very cobbly loam, extremely stony loam.	GP-GM, GM	A-1, A-2	30-50	30-60	20-50	15-40	5-25	20-35	NP-10
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
1B, 1C, 1D	0-16	15-27	1.35-1.55	0.6-2.0	0.15-0.18	5.1-7.3	Low	0.15	5	6-10
Abegg	16-56	27-35	1.30-1.45	0.6-2.0	0.05-0.07	5.1-7.3	Low	0.20		
	56-60	10-18	1.40-1.60	2.0-6.0	0.04-0.08	5.1-7.3	Low	0.20		
2F, 3F	0-3	10-18	1.40-1.60	0.6-2.0	0.21-0.23	5.6-6.5	Low	0.15	3	6-9
Althouse	3-46	10-18	1.35-1.55	0.6-2.0	0.15-0.20	6.1-6.5	Low	0.20		
	46	---	---	---	---	---	---	---		
4	0-6	20-27	1.35-1.45	0.6-2.0	0.13-0.17	6.1-6.5	Low	0.24	5	2-5
Banning	6-60	27-35	1.35-1.40	0.2-0.6	0.15-0.20	6.1-7.3	Moderate	0.28		
5B, 5C	0-9	8-18	1.40-1.60	2.0-6.0	0.07-0.12	5.6-6.0	Low	0.24	5	1-3
Barron	9-60	8-18	1.40-1.60	2.0-6.0	0.07-0.12	5.6-6.0	Low	0.28		
6F*, 7F*:										
Beekman	0-5	15-25	1.35-1.55	0.6-2.0	0.08-0.16	5.6-6.5	Low	0.20	2	2-4
	5-25	18-30	1.30-1.50	0.6-2.0	0.03-0.11	5.6-6.5	Low	0.24		
	25	---	---	---	---	---	---	---		
Colestine	0-12	18-25	1.10-1.40	0.6-2.0	0.11-0.19	5.6-7.3	Low	0.28	2	2-4
	12-34	22-30	1.45-1.65	0.6-2.0	0.10-0.18	5.1-6.5	Low	0.24		
	34	---	---	---	---	---	---	---		
8G*, 9G*:										
Beekman	0-5	15-25	1.35-1.55	0.6-2.0	0.08-0.16	5.6-6.5	Low	0.20	2	2-4
	5-25	18-30	1.30-1.50	0.6-2.0	0.03-0.11	5.6-6.5	Low	0.24		
	25	---	---	---	---	---	---	---		
Vermisa	0-3	10-20	1.2-1.3	2.0-6.0	0.07-0.15	6.1-7.3	Low	0.28	1	1-3
	3-15	18-27	1.3-1.4	2.0-6.0	0.06-0.12	5.6-6.5	Low	0.32		
	15	---	---	---	---	---	---	---		
10E, 10F	0-14	3-15	1.35-1.60	0.6-2.0	0.06-0.09	5.6-6.0	Low	0.10	5	6-9
Bigelow	14-65	3-15	1.40-1.60	0.6-2.0	0.06-0.08	5.1-6.0	Low	0.15		
11B, 11C	0-15	27-40	1.35-1.55	0.6-2.0	0.16-0.21	6.1-6.5	Moderate	0.28	5	.5-1
Brockman	15-25	35-45	1.25-1.45	0.2-0.6	0.09-0.14	6.1-6.5	High	0.20		
	25-60	50-65	1.25-1.45	<0.06	0.06-0.12	6.1-7.3	High	0.20		
12B, 12D	0-9	27-40	1.35-1.55	0.6-2.0	0.14-0.19	6.1-6.5	Moderate	0.24	5	.5-1
Brockman	9-16	35-45	1.25-1.45	0.2-0.6	0.09-0.14	6.1-6.5	High	0.20		
	16-60	50-65	1.25-1.45	<0.06	0.06-0.12	6.1-7.3	High	0.20		
13	0-12	20-25	1.35-1.50	0.6-2.0	0.10-0.13	5.6-7.3	Low	0.20	5	1-3
Brockman Variant	12-62	25-35	1.30-1.50	0.6-2.0	0.11-0.19	6.1-7.3	Moderate	0.28		
14	0-10	5-10	1.30-1.50	2.0-6.0	0.07-0.09	5.6-7.3	Low	0.10	2	1-3
Camas	10-60	0-5	1.40-1.60	>20	0.03-0.05	5.6-6.5	Low	0.10		
15*:										
Camas	0-10	5-10	1.30-1.50	2.0-6.0	0.07-0.09	5.6-7.3	Low	0.10	2	1-3
	10-60	0-5	1.40-1.60	>20	0.03-0.05	5.6-6.5	Low	0.10		
Newberg	0-15	7-15	1.20-1.40	2.0-6.0	0.12-0.15	5.6-6.5	Low	0.28	5	2-4
	15-24	5-15	1.20-1.40	2.0-6.0	0.12-0.15	5.6-6.5	Low	0.24		
	24-61	2-10	1.20-1.40	6.0-20	0.09-0.13	5.6-7.3	Low	0.17		
16	0-15	12-18	1.35-1.50	2.0-6.0	0.08-0.11	5.6-6.5	Low	0.10	5	2-8
Central Point	15-36	12-18	1.40-1.60	2.0-6.0	0.08-0.12	5.6-7.3	Low	0.20		
	36-60	8-18	1.45-1.65	2.0-6.0	0.06-0.11	5.6-7.3	Low	0.17		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
17B	0-3	8-18	1.40-1.60	2.0-6.0	0.11-0.13	6.1-7.3	Low	0.28	5	1-2
Clawson	3-46	8-18	.140-1.60	2.0-6.0	0.10-0.13	6.1-7.3	Low	0.32		
	46-60	8-18	.145-1.65	2.0-6.0	0.07-0.14	6.1-7.3	Low	0.32		
18A, 18B	0-18	40-60	1.20-1.30	0.06-0.2	0.11-0.15	6.1-7.3	High	0.20	5	2-6
Copsey	18-40	40-60	1.20-1.30	<0.06	0.10-0.14	6.1-7.3	High	0.17		
	40-60	30-50	1.20-1.30	0.06-0.2	0.10-0.14	6.1-7.8	High	0.17		
19D*, 19E*, 20F*, 21F*:										
Cornutt	0-11	27-40	1.30-1.40	0.2-0.6	0.12-0.18	5.6-6.5	Moderate	0.28	3	2-6
	11-41	40-55	1.20-1.30	0.06-0.2	0.09-0.14	6.1-6.5	High	0.20		
	41	---	---	---	---	---	---	---		
Dubakella	0-7	20-35	1.30-1.40	0.2-0.6	0.08-0.12	5.6-7.3	Moderate	0.24	2	4-10
	7-28	35-50	1.20-1.30	0.06-0.2	0.08-0.10	6.1-7.8	Moderate	0.24		
	28	---	---	---	---	---	---	---		
22	0-8	30-40	1.25-1.35	0.2-0.6	0.19-0.21	5.6-6.5	Moderate	0.28	5	4-8
Cove	8-60	50-60	1.20-1.35	<0.06	0.10-0.14	6.1-7.3	High	0.17		
23G	0-4	5-10	1.40-1.60	2.0-6.0	0.02-0.04	6.1-6.5	Low	0.10	2	6-10
Crannler	4-32	4-10	1.40-1.60	2.0-6.0	0.02-0.04	5.6-6.0	Low	0.15		
	32	---	---	---	---	---	---	---		
24G*:										
Crannler	0-4	5-10	1.40-1.60	2.0-6.0	0.02-0.04	6.1-6.5	Low	0.10	2	6-10
	4-32	4-10	1.40-1.60	2.0-6.0	0.02-0.04	5.6-6.0	Low	0.15		
	32	---	---	---	---	---	---	---		
Rock outcrop.										
25E*.										
Cryaquepts										
26F*.										
Cryumbrepts										
27C, 27D	0-11	18-25	1.40-1.50	0.6-2.0	0.15-0.18	5.6-6.5	Low	0.28	2	2-4
Debenger	11-28	20-35	1.35-1.45	0.6-2.0	0.15-0.21	5.1-6.0	Low	0.32		
	28	---	---	---	---	---	---	---		
28F*, 29F*:										
Dubakella	0-7	20-35	1.30-1.40	0.2-0.6	0.08-0.12	5.6-7.3	Moderate	0.24	2	4-10
	7-28	35-50	1.20-1.30	0.06-0.2	0.08-0.10	6.1-7.8	Moderate	0.24		
	28	---	---	---	---	---	---	---		
Pearsoll	0-5	30-40	1.30-1.40	0.2-0.6	0.09-0.15	6.1-7.3	High	0.20	1	4-7
	5-14	40-60	1.20-1.30	0.06-0.2	0.07-0.11	6.1-7.3	High	0.17		
	14	---	---	---	---	---	---	---		
30*.										
Dumps										
31D, 31E	0-10	35-55	1.20-1.40	0.06-0.2	0.07-0.15	6.1-7.3	High	0.20	5	3-5
Eightlar	10-61	55-65	1.20-1.40	<0.06	0.06-0.12	6.6-7.3	High	0.17		
32F*, 33F*:										
Eightlar	0-10	35-55	1.20-1.40	0.06-0.2	0.07-0.15	6.1-7.3	High	0.20	5	3-5
	10-61	55-65	1.20-1.40	<0.06	0.06-0.12	6.6-7.3	High	0.17		
Dubakella	0-7	20-35	1.30-1.40	0.2-0.6	0.08-0.12	5.6-7.3	Moderate	0.24	2	4-10
	7-28	35-50	1.20-1.30	0.06-0.2	0.08-0.10	6.1-7.8	Moderate	0.24		
	28	---	---	---	---	---	---	---		
34	0-9	12-18	1.35-1.50	0.6-2.0	0.16-0.20	5.6-7.3	Low	0.32	5	2-5
Evans	9-64	10-18	.140-1.55	0.6-2.0	0.13-0.20	5.6-6.5	Low	0.43		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organi matte
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
35F*, 36F*:										
Fantz	0-12	18-22	1.35-1.55	0.6-2.0	0.09-0.13	6.1-6.5	Low	0.15	2	3-6
	12-29	18-27	1.35-1.55	0.6-2.0	0.06-0.11	6.1-7.3	Low	0.24		
	29	---	---	---	---	---	---	----		
Knapke	0-13	18-22	1.35-1.55	0.6-2.0	0.05-0.12	6.1-6.5	Low	0.15	5	3-6
	13-62	18-27	1.35-1.55	0.6-2.0	0.05-0.12	6.1-7.3	Low	0.24		
37G*:										
Fantz	0-12	18-22	1.35-1.55	0.6-2.0	0.09-0.13	6.1-6.5	Low	0.15	2	3-6
	12-29	18-27	1.35-1.55	0.6-2.0	0.06-0.11	6.1-7.3	Low	0.24		
	29	---	---	---	---	---	---	----		
Rock outcrop.										
38A, 38C	0-13	20-27	1.35-1.55	0.6-2.0	0.12-0.17	6.1-6.5	Low	0.20	5	2-4
Foehlin	13-66	27-35	1.30-1.45	0.2-0.6	0.13-0.19	6.1-6.5	Moderate	0.28		
39D, 40F, 41F	0-16	5-15	1.40-1.60	2.0-6.0	0.09-0.13	5.6-6.0	Low	0.15	4	6-10
Goodwin	16-55	5-15	1.40-1.60	2.0-6.0	0.06-0.08	5.6-6.5	Low	0.20		
	55	---	---	---	---	---	---	----		
42B, 42C, 42D, 42E	0-14	10-18	1.40-1.60	0.6-2.0	0.14-0.17	5.6-6.5	Low	0.37	4	1-3
Holland	14-28	22-30	1.30-1.50	0.2-0.6	0.16-0.21	5.1-6.0	Moderate	0.43		
	28-49	15-25	1.30-1.50	0.2-0.6	0.15-0.18	5.1-6.0	Low	0.43		
	49	---	---	---	---	---	---	----		
43E, 44F, 45F	0-3	13-22	1.35-1.50	0.6-2.0	0.06-0.13	5.6-6.5	Low	0.17	2	5-8
Jayar	3-31	18-30	1.35-1.50	0.6-2.0	0.06-0.14	5.6-6.5	Low	0.24		
	31	---	---	---	---	---	---	----		
46	0-10	10-18	1.45-1.60	2.0-6.0	0.11-0.13	6.1-7.3	Low	0.24	5	1-3
Jerome	10-35	10-18	1.40-1.60	2.0-6.0	0.10-0.17	6.1-7.3	Low	0.37		
	35-64	40-60	1.25-1.30	<0.06	0.14-0.16	6.6-7.3	High	0.24		
47E, 48F	0-9	18-27	1.35-1.50	0.6-2.0	0.07-0.16	5.6-6.5	Low	0.20	3	3-6
Josephine	9-59	27-35	1.30-1.40	0.2-0.6	0.13-0.21	4.5-6.5	Moderate	0.28		
	59	---	---	---	---	---	---	----		
49D, 49E, 50F, 51F	0-18	27-40	1.30-1.40	0.2-0.6	0.16-0.21	5.6-6.0	Moderate	0.28	4	1-2
Jumpoff	18-55	40-50	1.20-1.30	0.06-0.2	0.10-0.16	5.6-6.0	High	0.28		
	55	---	---	---	---	---	---	----		
52	0-7	15-23	1.35-1.50	0.6-2.0	0.18-0.22	5.6-6.5	Low	0.32	5	2-5
Kerby	7-40	18-27	1.35-1.50	0.6-2.0	0.15-0.19	5.6-6.5	Low	0.37		
	40-60	5-15	1.40-1.80	6.0-20	0.05-0.09	5.6-6.5	Low	0.10		
53B, 53C, 53D, 53E, 54F, 55F	0-11	18-27	1.35-1.50	0.6-2.0	0.13-0.18	5.6-6.5	Low	0.32	3	1-3
Manita	11-50	35-45	1.20-1.40	0.2-0.6	0.12-0.21	5.6-6.5	High	0.24		
	50	---	---	---	---	---	---	----		
56F	0-7	15-27	1.35-1.55	0.6-2.0	0.10-0.15	5.6-6.5	Low	0.17	1	1-3
McMullin	7-14	20-35	1.30-1.50	0.6-2.0	0.14-0.17	5.6-6.5	Low	0.20		
	14	---	---	---	---	---	---	----		
57	0-15	7-15	1.20-1.40	2.0-6.0	0.12-0.15	5.6-6.5	Low	0.28	5	2-4
Newberg	15-24	5-15	1.20-1.40	2.0-6.0	0.12-0.15	5.6-6.5	Low	0.24		
	24-61	2-10	1.20-1.40	6.0-20	0.09-0.13	5.6-7.3	Low	0.17		
58F*, 58G*:										
Pearsoll	0-5	30-40	1.30-1.40	0.2-0.6	0.09-0.15	6.1-7.3	High	0.20	1	4-7
	5-14	40-60	1.20-1.30	0.06-0.2	0.07-0.11	6.1-7.3	High	0.17		
	14	---	---	---	---	---	---	----		
Rock outcrop.										

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
59F, 60F	0-7	22-27	1.25-1.35	0.6-2.0	0.12-0.15	6.1-6.5	Low	0.24	2	4-7
Perdin	7-24	35-45	1.20-1.30	0.06-0.2	0.11-0.18	6.6-7.3	High	0.28		
	24	---	---	---	---	---	---	---		
61B, 61C, 61D, 61E	0-3	20-27	1.15-1.40	0.6-2.0	0.11-0.15	5.6-7.3	Low	0.24	5	1-3
Pollard	3-60	35-50	1.25-1.50	0.06-0.2	0.09-0.12	5.1-6.5	Moderate	0.32		
62F	0-20	20-27	1.15-1.40	0.6-2.0	0.09-0.11	5.6-7.3	Low	0.20	5	1-3
Pollard	20-60	35-50	1.25-1.50	0.06-0.2	0.09-0.12	5.1-6.5	Moderate	0.32		
63F*:										
Pollard	0-20	20-27	1.15-1.40	0.6-2.0	0.09-0.11	5.6-7.3	Low	0.20	5	1-3
	20-60	35-50	1.25-1.50	0.06-0.2	0.09-0.12	5.1-6.5	Moderate	0.32		
Beekman	0-5	15-25	1.35-1.55	0.6-2.0	0.08-0.16	5.6-6.5	Low	0.20	2	2-4
	5-25	18-30	1.30-1.50	0.6-2.0	0.03-0.11	5.6-6.5	Low	0.24		
	25	---	---	---	---	---	---	---		
64*. Riverwash										
65F*, 66F*:										
Rogue	0-4	5-15	1.40-1.60	2.0-6.0	0.07-0.11	5.6-7.3	Low	0.17	4	6-10
	4-30	5-15	1.40-1.60	2.0-6.0	0.07-0.11	5.6-7.3	Low	0.28		
	30-56	3-10	1.45-1.65	2.0-6.0	0.05-0.10	5.1-6.0	Low	0.32		
	56	---	---	---	---	---	---	---		
Goodwin	0-16	5-15	1.40-1.60	2.0-6.0	0.09-0.13	5.6-6.0	Low	0.15	4	6-10
	16-55	5-15	1.40-1.60	2.0-6.0	0.06-0.08	5.6-6.5	Low	0.20		
	55	---	---	---	---	---	---	---		
67B, 67C	0-5	12-20	1.15-1.45	0.6-2.0	0.13-0.17	6.1-7.3	Low	0.24	5	2-4
Ruch	5-60	24-30	1.45-1.70	0.2-0.6	0.12-0.16	5.6-7.3	Moderate	0.37		
68B, 68D	0-6	22-27	1.35-1.50	0.6-2.0	0.14-0.18	5.1-6.0	Low	0.24	5	1-3
Selmac	6-18	27-35	1.30-1.40	0.2-0.6	0.14-0.20	5.1-6.0	Moderate	0.28		
	18-60	55-70	1.20-1.30	<0.06	0.06-0.09	5.6-6.5	High	0.28		
69E, 70F, 71F	0-4	8-12	1.40-1.60	2.0-6.0	0.07-0.12	5.6-6.5	Low	0.15	3	4-8
Siskiyou	4-36	8-12	1.40-1.60	2.0-6.0	0.07-0.09	5.1-6.5	Low	0.28		
	36	---	---	---	---	---	---	---		
72F*:										
Speaker	0-13	18-25	1.35-1.50	0.6-2.0	0.11-0.16	5.6-6.5	Low	0.20	2	2-5
	13-30	25-35	1.30-1.45	0.2-0.6	0.12-0.20	5.6-6.0	Moderate	0.32		
	30	---	---	---	---	---	---	---		
Josephine	0-13	18-27	1.35-1.50	0.6-2.0	0.07-0.16	5.6-6.5	Low	0.20	3	3-6
	13-41	27-35	1.30-1.40	0.2-0.6	0.13-0.21	4.5-6.5	Moderate	0.28		
	41	---	---	---	---	---	---	---		
73	0-6	10-16	1.35-1.50	2.0-6.0	0.09-0.14	6.1-6.5	Low	0.17	5	2-3
Takilma	6-18	12-18	1.30-1.50	2.0-6.0	0.06-0.11	6.1-6.5	Low	0.17		
	18-60	10-18	1.35-1.60	6.0-20.0	0.03-0.05	6.6-7.3	Low	0.20		
74	0-18	18-25	1.35-1.50	0.6-2.0	0.05-0.09	6.1-6.5	Low	0.15	5	1-3
Takilma Variant	18-28	20-25	1.35-1.55	0.6-2.0	0.05-0.09	6.6-7.3	Low	0.15		
	28-63	0-10	1.55-1.70	6.0-20	0.03-0.05	6.6-7.3	Low	0.10		
75F, 76F	0-9	5-18	1.25-1.50	2.0-6.0	0.16-0.19	6.1-6.5	Low	0.32	4	1-3
Tethrick	9-53	5-18	1.40-1.70	0.6-2.0	0.14-0.19	6.1-6.5	Low	0.55		
	53	---	---	---	---	---	---	---		
77E, 78F	0-7	15-22	1.35-1.55	0.6-2.0	0.17-0.20	5.1-6.5	Low	0.37	3	2-4
Vannoy	7-29	27-35	1.55-1.70	0.2-0.6	0.12-0.18	5.6-6.5	Moderate	0.32		
	29	---	---	---	---	---	---	---		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
79F*:										
Vannoy	0-14	15-22	1.35-1.55	0.6-2.0	0.17-0.20	5.1-6.5	Low	0.37	3	2-4
	14-33	27-35	1.55-1.70	0.2-0.6	0.12-0.18	5.6-6.5	Moderate	0.32		
	33	---	---	---	---	---	---	---		
Voorhies	0-15	15-22	1.35-1.50	0.6-2.0	0.08-0.13	6.6-7.3	Low	0.20	2	2-4
	15-36	25-35	1.30-1.50	0.6-2.0	0.07-0.15	6.1-7.3	Moderate	0.24		
	36	---	---	---	---	---	---	---		
80G*, 81G*:										
Vermisa	0-3	10-20	1.2-1.3	2.0-6.0	0.07-0.15	6.1-7.3	Low	0.28	1	1-3
	3-15	18-27	1.3-1.4	2.0-6.0	0.06-0.12	5.6-6.5	Low	0.32		
	15	---	---	---	---	---	---	---		
Beekman	0-5	15-25	1.35-1.55	0.6-2.0	0.08-0.16	5.6-6.5	Low	0.20	2	2-4
	5-25	18-30	1.30-1.50	0.6-2.0	0.03-0.11	5.6-6.5	Low	0.24		
	25	---	---	---	---	---	---	---		
82G*:										
Vermisa	0-3	10-20	1.2-1.3	2.0-6.0	0.07-0.15	6.1-7.3	Low	0.28	1	1-3
	3-15	18-27	1.3-1.4	2.0-6.0	0.06-0.12	5.6-6.5	Low	0.32		
	15	---	---	---	---	---	---	---		
Rock outcrop.										
83	0-8	20-27	1.20-1.40	0.6-2.0	0.16-0.18	5.6-7.3	Low	0.32	5	4-8
Wapato	8-42	27-35	1.20-1.40	0.2-0.6	0.15-0.17	5.6-6.5	Moderate	0.32		
	42-60	40-50	1.20-1.40	0.2-0.6	0.15-0.17	5.6-6.5	Moderate	0.28		
84F*:										
Witzel	0-7	18-25	1.35-1.50	0.6-2.0	0.07-0.10	5.6-6.5	Low	0.20	1	1-4
	7-14	27-35	1.30-1.40	0.2-0.6	0.10-0.15	5.6-6.5	Low	0.20		
	14	---	---	---	---	---	---	---		
Rock outcrop.										
85G	0-8	12-25	1.40-1.50	0.6-2.0	0.05-0.10	5.6-6.5	Low	0.20	1	1-4
Woodseye	8-18	18-27	1.35-1.50	0.6-2.0	0.03-0.07	5.1-6.5	Low	0.24		
	18	---	---	---	---	---	---	---		
86G*:										
Woodseye	0-4	12-25	1.40-1.50	0.6-2.0	0.05-0.10	5.6-6.5	Low	0.20	1	1-4
	4-11	18-27	1.35-1.50	0.6-2.0	0.03-0.07	5.1-6.5	Low	0.24		
	11	---	---	---	---	---	---	---		
Jayar	0-3	13-22	1.35-1.50	0.6-2.0	0.06-0.13	5.6-6.5	Low	0.17	2	5-8
	3-31	18-30	1.35-1.50	0.6-2.0	0.06-0.14	5.6-6.5	Low	0.24		
	31	---	---	---	---	---	---	---		
87F*:										
Woodseye	0-8	12-25	1.40-1.50	0.6-2.0	0.05-0.10	5.6-6.5	Low	0.20	1	1-4
	8-18	18-27	1.35-1.50	0.6-2.0	0.03-0.07	5.1-6.5	Low	0.24		
	18	---	---	---	---	---	---	---		
Rock outcrop.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "brief," "occasional," and "frequent" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table		Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft		In				
1B, 1C, 1D---------- Abegg	B	None---------	---	---	>6.0	---	>60	---	---	Moderate	Moderate.
2F, 3F---------- Althouse	B	None---------	---	---	>6.0	---	40-60	Soft	Moderate---	Low-------	Moderate.
4---------- Banning	C	None---------	---	---	1.0-3.0	Jan-Jun	>60	---	---	High------	Low.
5B, 5C---------- Barron	B	None---------	---	---	>6.0	---	>60	---	---	Low-------	Moderate.
6F*, 7F*: Beekman----------	C	None---------	---	---	>6.0	---	20-40	Hard	---	Low-------	Low.
Colestine---------	C	None---------	---	---	>6.0	---	20-40	Hard	---	Moderate	Low.
8G*, 9G*: Beekman----------	C	None---------	---	---	>6.0	---	20-40	Hard	---	Low-------	Low.
Vermisa----------	D	None---------	---	---	>6.0	---	10-20	Hard	---	Moderate	Low.
10E, 10F---------- Bigelow	B	None---------	---	---	>6.0	---	>60	---	Moderate---	Moderate	Low.
11B, 11C, 12B, 12D---------- Brockman	C	None---------	---	---	2.0-3.0	Dec-Mar	>60	---	---	High------	Low.
13---------- Brockman Variant	B	None---------	---	---	>6.0	---	>60	---	---	Moderate	Low.
14---------- Camas	A	Occasional	Brief------	Nov-May	>6.0	---	>60	---	---	Moderate	Moderate.
15*: Camas----------	A	Occasional	Brief------	Nov-May	>6.0	---	>60	---	---	Moderate	Moderate.
Newberg----------	B	Occasional	Brief------	Dec-Mar	>6.0	---	>60	---	---	Low-------	Moderate.
16---------- Central Point	B	None---------	---	---	4.0-6.0	Dec-Mar	>60	---	---	Low-------	Moderate.
17B---------- Clawson	C	None---------	---	---	1.0-3.0	Nov-Jun	>60	---	---	Moderate	Moderate.
18A, 18B---------- Copsey	D	Rare---------	---	---	0.5-1.5	Dec-Jun	>60	---	---	High------	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft		In				
19D*, 19E*, 20F*, 21F*:											
Cornutt	C	None	---	---	>6.0	---	40-60	Soft	---	High	Moderate.
Dubakella	C	None	---	---	>6.0	---	20-40	Hard	---	High	Low.
22--- Cove	D	Occasional	Brief	Dec-Apr	0-1.0	Dec-Jun	>60	---	---	High	Moderate.
23G--- Crannler	B	None	---	---	>6.0	---	20-40	Hard	Moderate	Low	Moderate.
24G*:											
Crannler	B	None	---	---	>6.0	---	20-40	Hard	Moderate	Low	Moderate.
Rock outcrop.											
25E*. Cryaquepts											
26F*. Cryumbrepts											
27C, 27D--- Debenger	C	None	---	---	>6.0	---	20-40	Soft	---	Moderate	Moderate.
28F*, 29F*:											
Dubakella	C	None	---	---	>6.0	---	20-40	Hard	---	High	Low.
Pearsoll	D	None	---	---	>6.0	---	10-20	Hard	---	High	Low.
30*. Dumps											
31D, 31E--- Eightlar	D	None	---	---	>6.0	---	>60	---	---	High	Low.
32F*, 33F*:											
Eightlar	D	None	---	---	>6.0	---	>60	---	---	High	Low.
Dubakella	C	None	---	---	>6.0	---	20-40	Hard	---	High	Low.
34--- Evans	B	Occasional	Brief	Dec-Mar	>6.0	---	>60	---	---	Low	Low.
35F*, 36F*:											
Fantz	C	None	---	---	>6.0	---	20-40	Hard	---	Low	Low.
Knapke	B	None	---	---	>6.0	---	>60	---	---	Low	Low.
37G*:											
Fantz	C	None	---	---	>6.0	---	20-40	Hard	---	Low	Low.
Rock outcrop.											

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft		In				
38A, 38C---------- Foehlin	B	None--------	---	---	>6.0	---	>60	---	---	Moderate	Low.
39D, 40F, 41F----- Goodwin	B	None--------	---	---	>6.0	---	40-60	Soft	Moderate---	Low------	Moderate.
42B, 42C, 42D, 42E---------- Holland	B	None--------	---	---	>6.0	---	>40	Soft	---	Moderate	Moderate.
43E, 44F, 45F----- Jayar	C	None--------	---	---	>6.0	---	20-40	Hard	Moderate---	Low------	Low.
46---------- Jerome	D	None--------	---	---	0.5-1.5	Dec-Jun	>60	---	---	High-----	Moderate.
47E, 48F---------- Josephine	B	None--------	---	---	>6.0	---	40-60	Soft	---	Moderate	Moderate.
49D, 49E, 50F, 51F---------- Jumpoff	C	None--------	---	---	2.5-3.5	Jan-Jun	40-60	Soft	Moderate---	High-----	Moderate.
52---------- Kerby	B	None--------	---	---	>6.0	---	>60	---	---	Low------	Moderate.
53B, 53C, 53D, 53E, 54F, 55F---- Manita	C	None--------	---	---	>6.0	---	40-60	Soft	---	High-----	Moderate.
56F---------- McMullin	D	None--------	---	---	>6.0	---	12-20	Hard	---	Moderate	Moderate.
57---------- Newberg	B	Occasional	Brief-----	Dec-Mar	>6.0	---	>60	---	---	Low------	Moderate.
58F*, 58G*: Pearsoll--------- Rock outcrop.	D	None--------	---	---	>6.0	---	10-20	Hard	---	High-----	Low.
59F, 60F---------- Perdin	C	None--------	---	---	>6.0	---	20-40	Soft	Moderate---	High-----	Low.
61B, 61C, 61D, 61E, 62F---------- Pollard	C	None--------	---	---	>6.0	---	>60	---	---	High-----	Moderate.
63F*: Pollard---------- Beekman----------	C C	None-------- None--------	--- ---	--- ---	>6.0 >6.0	--- ---	>60 20-40	--- Hard	--- ---	High----- Low------	Moderate. Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft		In				
64*. Riverwash											
65F*, 66F*: Rogue	B	None	---	---	>6.0	---	40-60	Soft	Moderate	Low	High.
Goodwin	B	None	---	---	>6.0	---	40-60	Soft	Moderate	Low	Moderate.
67B, 67C Ruch	B	None	---	---	>6.0	---	>60	---	---	Moderate	Moderate.
68B, 68D Selmac	D	None	---	---	1.5-3.0	Dec-May	>60	---	---	High	Moderate.
69E, 70F, 71F Siskiyou	B	None	---	---	>6.0	---	20-40	Soft	---	Moderate	Moderate.
72F*: Speaker	B	None	---	---	>6.0	---	20-40	Soft	---	Moderate	Moderate.
Josephine	B	None	---	---	>6.0	---	40-60	Soft	---	Moderate	Moderate.
73 Takilma	B	None	---	---	>6.0	---	>60	---	---	Moderate	Low.
74 Takilma Variant	B	None	---	---	>6.0	---	>60	---	---	Moderate	Low.
75F, 76F Tethrick	B	None	---	---	>6.0	---	40-60	Soft	---	Moderate	Moderate.
77E, 78F Vannoy	C	None	---	---	>6.0	---	20-40	Soft	---	Moderate	Moderate.
79F*: Vannoy	C	None	---	---	>6.0	---	20-40	Soft	---	Moderate	Moderate.
Voorhies	C	None	---	---	>6.0	---	20-40	Soft	---	Moderate	Low.
80G*, 81G*: Vermisa	D	None	---	---	>6.0	---	10-20	Hard	---	Moderate	Low.
Beekman	C	None	---	---	>6.0	---	20-40	Hard	---	Low	Low.
82G*: Vermisa	D	None	---	---	>6.0	---	10-20	Hard	---	Moderate	Low.
Rock outcrop.											
83 Wapato	D	Frequent	Brief	Dec-Apr	0-1.0	Dec-May	>60	---	---	High	Moderate.
84F*: Witzel	D	None	---	---	>6.0	---	12-20	Hard	---	Moderate	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft		In				
84F*: Rock outcrop.											
85G---------- Woodseye	D	None-------	---	---	>6.0	---	10-20	Hard	Moderate---	Moderate	Moderate.
86G*: Woodseye---------	D	None-------	---	---	>6.0	---	10-20	Hard	Moderate---	Moderate	Moderate.
Jayar----------	C	None-------	---	---	>6.0	---	20-40	Hard	Moderate---	Low------	Low.
87F*: Woodseye---------	D	None-------	---	---	>6.0	---	10-20	Hard	Moderate---	Moderate	Moderate.
Rock outcrop.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL CHARACTERISTICS OF SELECTED SOILS

[The symbol < means less than; > means more than. Dashes indicate that no determination was made]

Soil name and sample number	Depth	Horizon	Particle-size distribution			Bulk density 1/3 bar	Water content	
			Sand (>2.0 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)		1/3 bar	15 bar
	In		Pct	Pct	Pct	G/cc	Pct	Pct
Abegg gravelly loam---------	0-4	A11	44.5	34.1	21.3	---	37.0	16.8
S73 Oreg.-17-6 (1-6)[1]	4-9	A12	39.0	35.9	25.0	---	35.0	15.5
	9-16	B1	40.4	34.4	25.1	---	26.1	13.4
	16-27	B21t	39.4	32.5	28.2	---	23.9	13.3
	27-38	B22t	37.8	31.7	30.5	---	23.9	14.4
	38-56	B3t	43.4	32.4	24.3	---	23.1	14.1
	56-60	C	---	---	---	---	---	---
Althouse very gravelly silt loam----------	0-3	A1	25.2	62.3	12.5	---	39.0	13.0
S76 Oreg.-033-82U (1-5)[1]	3-9	B1	23.5	63.1	13.4	---	32.1	9.1
	9-18	B21	25.0	61.3	13.7	---	28.9	8.9
	18-31	B22	27.9	59.3	12.8	---	28.9	8.9
	31-46	C1	34.2	55.9	9.9	---	22.3	7.7
	46-50	C2r	---	---	---	---	---	---
Bigelow very gravelly sandy loam----------	0-5	A11	64.4	28.1	7.4	---	21.6	9.6
S76 Oreg.-033-14 (1-5)[1]	5-14	A12	64.2	29.4	6.4	---	19.9	8.5
	14-26	A13	67.7	27.5	4.7	---	17.6	6.7
	26-50	C1	70.4	26.4	3.2	---	15.5	6.0
	50-65	C2	69.2	27.7	3.1	---	16.6	7.1
	65-67	C3	---	---	---	---	---	---
Crannler very stony sandy loam----------	0-4	A	72.7	20.5	6.8	---	21.9	9.5
S76 Oreg.-033-91U (1-3)[1]	4-14	C1	73.7	20.4	5.9	---	19.0	8.1
	14-32	C2	74.3	21.5	4.1	---	15.4	6.0
	32	R	---	---	---	---	---	---
Eightlar extremely stony clay----------	0-3	A11	24.0	25.2	50.8	---	46.3	29.5
S77 Oreg.-033-1 (1-6)[1]	3-10	A12	17.0	22.2	60.8	---	51.0	35.1
	10-19	B1	18.3	21.2	60.5	---	54.5	35.7
	19-29	B2	8.9	19.0	72.1	---	82.8	55.1
	29-44	B3	15.7	22.9	61.4	---	90.1	59.4
	44-61	C	13.0	21.1	65.9	---	95.1	61.4
Holland sandy loam----------	0-4	A1	56.3	30.0	13.7	1.6	23.7	6.8
S71 Oreg.-17-2 (1-7)[1]	4-8	A3	54.5	32.9	12.5	---	---	6.0
	8-14	B1	52.4	32.9	12.5	1.8	20.0	6.9
	14-28	B21t	47.7	28.2	24.1	1.9	21.8	10.8
	28-34	B31t	53.0	28.2	18.9	---	---	10.1
	34-49	B32	61.4	27.0	11.6	---	---	---
	49-60	Cr	60.1	28.6	11.3	---	---	---

See footnotes at end of table.

TABLE 17.--PHYSICAL CHARACTERISTICS OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Horizon	Particle-size distribution			Bulk density 1/3 bar	Water content	
			Sand (>2.0 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)		1/3 bar	15 bar
	In		Pct	Pct	Pct	G/cc	Pct	Pct
Josephine gravelly loam-----	0-3	A1	41.1	36.9	22.0	---	---	21.0
S69 Oreg.-17-1 (1-9)[2]	3-9	B1	28.6	44.5	26.9	0.97	38.8	13.8
	9-16	B21t	27.7	44.3	28.0	1.19	34.2	13.3
	16-23	B22t	30.3	39.9	29.8	1.18	39.1	14.0
	23-32	B22t	27.4	39.7	32.9	1.23	35.1	16.0
	32-42	B23t	28.0	37.9	34.1	1.42	24.4	17.0
	42-51	B3	31.4	37.9	30.7	1.38	23.6	15.4
	51-59	C1	30.5	40.2	29.3	1.34	22.9	15.1
	59-70	Cr	31.6	40.1	28.3	1.44	23.5	14.5
Kerby loam-----------	0-4	Ap	37.4	44.3	18.3	---	27.8	9.9
S73 Oreg.-17-5 (1-6)[1]	4-7	A12	35.6	45.1	19.3	---	26.3	8.4
	7-18	B1	36.1	44.9	19.0	---	21.7	8.2
	18-29	B21	37.5	42.4	20.1	---	22.4	9.2
	29.40	B22	45.5	34.8	19.6	---	13.6	9.6
	40-52	11C1	73.8	11.4	14.9	---	13.6	7.5
	52-60	11C2	---	---	---	---	---	---
Pollard loam-----------	0-3	A11	37.6	35.9	26.4	---	27.6	13.1
S73 Oreg.-17-7 (1-5)[1]	3-7	A12	33.5	35.3	31.2	---	27.0	13.7
	7-15	B1	27.2	32.1	40.7	---	25.7	16.4
	15-24	B21t	22.5	25.7	51.7	---	28.9	20.3
	24-36	B22t	24.0	24.5	51.4	---	30.6	21.7
	36-60	B3t	---	---	---	---	---	---
Siskiyou gravelly sandy loam-----------	0-4	A1	59.8	29.3	10.9	---	29.5	9.9
S71 Oreg.-17-1 (1-6)[1]	4-11	B1	61.8	29.1	9.2	---	21.1	6.3
	11-19	B2	60.7	30.7	8.6	---	18.7	5.6
	19-31	C1	70.7	20.5	8.8	---	19.1	5.5
	31-36	C2	70.7	20.5	8.8	---	---	6.4
	36-46	C3r	77.5	14.8	7.7	---	---	---
Tethrick gravelly fine sandy loam-----------	0-4	A11	56.9	34.8	8.3	1.3	22.5	6.4
S75 Oreg.-17-1 (1-5)[1]	4-9	A12	55.1	36.6	8.3	1.5	19.8	6.3
	9-15	B1	54.3	8.2	1.4	18.9	17.5	5.6
	15-30	B2	54.2	38.5	7.3	1.5	17.5	5.0
	30-53	C1	66.4	29.8	3.7	1.7	13.1	4.3
	53-60	C2r	---	---	---	---	---	---

[1] Analyses were made at the Oregon Soil Characterization Laboratory, Oregon State University, Corvallis, Oregon.
[2] Analyses were made at the Soil Survey Laboratory, Soil Conservation Service, Riverside, California.

TABLE 18.--CHEMICAL CHARACTERISTICS OF SELECTED SOILS

[Dashes indicate that no determination was made]

Soil name and sample number	Depth	Organic matter	Organic carbon	Extractable iron	pH in water 1:1	Extractable cations (milliequivalents per 100 grams of soil)				Extractable acidity	Cation exchange capacity		Base saturation		Extractable phosphorus (parts per million)	Clay mineralogy[1]
						Ca	Mg	Na	K		NH4OAc	Sum	NH4OAc	Sum		
	In	Pct	Pct	Pct							Pct	Pct	Pct	Pct		
Abegg gravelly loam---------	0-4	17.30	---	---	6.0	14.7	3.0	0.2	1.0	23.2	36.0	---	53	45	33	---
S73-Oreg.	4-9	13.00	---	---	5.6	10.1	1.6	0.3	0.8	15.9	31.8	---	40	45	15	---
17-6 (1-6)[2]	9-16	4.50	---	---	5.5	2.5	1.1	0.2	0.6	13.8	17.3	---	25	24	6	---
	16-27	2.30	---	---	5.3	1.3	1.1	0.2	0.5	11.9	15.2	---	20	21	4	---
	27-38	---	---	---	5.5	2.1	1.6	0.1	0.5	11.6	16.0	---	27	27	3	---
	38-56	---	---	---	5.5	2.5	1.8	0.4	0.5	8.9	17.3	---	30	37	2	---
	56-60	---	---	---	---	---	---	---	---	---	---	---	--	--	--	---
Althouse very gravelly silt loam---------	0-3	8.95	---	---	6.0	15.9	1.3	0.1	0.8	18.8	32.6	---	56	49	2	---
S76-Oreg.-033	3-9	2.72	---	---	6.4	8.4	0.7	0.1	0.5	10.8	16.1	---	60	47	5	---
82U (1-5)[2]	9-18	1.81	---	---	6.2	5.5	0.6	0.1	0.4	6.7	13.5	---	49	50	4	---
	18-31	1.69	---	---	6.1	5.1	0.6	0.1	0.4	13.2	11.12	---	55	32	4	---
	31-46	0.60	---	---	6.2	3.5	0.6	0.1	0.4	7.3	8.6	---	54	39	7	---
	46-50	---	---	---	---	---	---	---	---	---	---	---	--	--	--	---
Bigelow very gravelly sandy loam---	0-5	9.14	---	---	6.0	12.5	4.3	0.3	1.2	15.2	21.1	---	87	55	43	
S76-Oreg.-	5-14	9.19	---	---	6.0	11.2	4.2	0.3	1.7	17.4	16.7	---	100	50	36	---
033-14 (1-5)[2]	14-26	7.48	---	---	5.9	13.1	4.8	0.3	1.3	14.2	13.8	---	100	58	32	---
	26-50	0.71	---	---	5.8	11.6	3.8	0.2	1.6	14.6	10.0	---	100	54	19	---
	50-65	5.34	---	---	5.4	7.7	2.0	0.2	0.3	17.5	14.0	---	73	38	31	---
	65-67	---	---	---	---	---	---	---	---	---	---	---	--	--	--	---
Crannler very stony sandy loam---------	0-4	8.05	---	---	6.4	1.2	0.2	0.1	0.1	10.5	21.5	---	7	13	41	---
S76-Oreg.-033	4-14	7.74	---	---	5.6	.4	0.2	0.1	0.1	28.3	15.0	---	5	3	31	---
91U (1-3)[2]	14-32	3.23	---	---	5.7	3.2	0.5	0.2	0.3	6.2	8.0	---	53	40	30	---
	32	---	---	---	---	---	---	---	---	---	---	---	--	--	--	---
Eightlar extremely stony clay---	0-3	6.96	---	---	7.3	3.8	35.0	0.1	0.4	7.3	25.0	---	--	--	5	---
S77-Oreg.	3-10	3.42	---	---	7.3	2.5	40.0	0.2	0.3	14.1	43.4	---	--	--	3	---
033-1 (1-6)[2]	10-19	2.20	---	---	7.3	2.1	41.0	0.1	0.3	5.3	45.4	---	--	--	3	
	19-29	0.67	---	---	6.9	1.9	65.0	0.2	0.1	12.6	57.7	---	--	--	4	---
	29-44	0.67	---	---	7.2	1.9	25.0	0.2	0.1	13.8	75.4	---	--	--	4	---
	44-61	0.67	---	---	7.1	1.9	25.0	0.2	0.1	6.7	61.4	---	--	--	4	---

See footnotes at end of table.

TABLE 18.--CHEMICAL CHARACTERISTICS OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Organic matter	Organic carbon	Extractable iron	pH in water 1:1	Extractable cations (milliequivalents per 100 grams of soil)				Extractable acidity	Cation exchange capacity		Base saturation		Extractable phosphorus (parts per million)	Clay mineralogy[1]
						Ca	Mg	Na	K		NH4OAc	Sum	NH4OAc	Sum		
	In	Pct	Pct	Pct							Pct	Pct	Pct	Pct		
Holland sandy loam---------	0-4	3.64	---	---	6.3	6.4	1.4	0.1	0.4	6.3	---	---	--	57	63	---
S71-Oreg.	4-8	0.96	---	---	6.0	3.7	1.1	0.1	0.2	4.1	---	---	--	56	21	---
17-2 (1-7)[2]	8-14	0.71	---	---	5.9	3.4	1.5	0.1	0.1	4.1	---	---	--	56	9	---
	14-28	---	---	---	5.6	4.7	3.6	0.1	0.1	4.3	---	---	--	66	2	---
	28-34	---	---	---	5.7	5.7	4.3	0.2	0.1	4.2	---	---	--	71	--	---
	34-49	---	---	---	5.5	7.4	5.1	0.2	0.1	3.1	---	---	--	80	2	---
	49-60	---	---	---	5.8	8.1	4.9	0.2	0	3.0	---	---	--	82	--	---
Josephine gravelly loam	0-3	---	7.68	3.6	6.0	19.0	1.9	0.1	1.3	18.4	33.2	40.7	67	55	--	VR3,KK2,MI1
S69-Oreg.-1	3-9	---	1.97	3.3	6.2	5.8	1.6	0.1	1.5	8.6	16.2	17.6	56	51	--	---
(1-9)[3]	9-16	---	0.86	3.4	6.1	3.4	1.3	0.1	1.6	6.7	13.1	13.1	49	49	--	---
	16-23	---	0.77	3.7	5.4	1.9	0.9	0.1	1.1	7.1	11.4	11.1	35	36	--	VR4,MI2,KK2
	23-32	---	0.49	4.4	5.2	1.2	0.5	---	0.8	8.6	11.4	11.1	22	23	--	---
	32-42	---	0.35	4.7	5.0	0.7	0.3	0.1	0.5	---	11.7	---	14	--	--	VR4,KK3,MI2
	42-51	---	0.39	4.2	4.9	0.9	0.1	0.1	0.3	9.8	11.5	11.2	12	12	--	---
	51-59	---	0.51	4.1	4.9	0.6	0.1	0.1	0.3	9.8	12.1	10.9	9	10	--	VR4,MI3,KK3
	59-70	---	0.52	2.9	4.9	1.5	0.1	0.1	0.3	10.2	14.3	12.2	14	16	--	---
Kerby loam----	0-4	5.90	---	---	6.1	4.5	1.8	0.2	0.4	13.0	15.1	---	46	34	13	---
S73-Oreg.	4-7	2.20	---	---	5.7	1.9	0.9	0.1	0.2	12.3	10.6	---	29	20	10	---
17-5 (1-6)[2]	7-18	1.80	---	---	5.6	1.5	1.2	0.2	0.1	10.3	9.2	---	33	23	7	---
	18-29	1.00	---	---	5.7	2.7	3.0	0.2	0.1	8.4	11.4	---	53	42	1	---
	29-40	---	---	---	5.9	3.5	4.9	0.2	0.1	8.3	13.0	---	67	40	2	---
	40-52	---	---	---	6.1	2.4	4.5	0.2	0.1	6.4	10.8	---	67	53	3	---
	52-60	---	---	---	---	---	---	---	---	---	---	---	--	--	--	---
Pollard loam--	0-3	5.40	---	---	5.9	5.3	0.9	0.1	0.5	13.3	16.0	---	43	34	8	---
S73-Oreg.	3-7	2.60	---	---	5.4	1.2	0.5	0.2	0.4	11.4	10.9	---	21	17	3	---
17-7 (1-5)[2]	7-15	2.00	---	---	5.2	0.9	0.7	0.1	0.4	11.2	10.7	---	20	16	2	---
	15-24	1.10	---	---	5.3	0.9	1.0	0.1	0.3	11.9	26.2	---	9	16	1	---
	24-36	---	---	---	5.2	0.3	0.7	0.1	0.2	14.0	21.6	---	6	9	1	---
	36-60	---	---	---	---	---	---	---	---	---	---	---	--	--	--	---
Siskiyou gravelly sandy loam---	0-4	6.73	---	---	6.5	12.2	1.3	0.1	0.6	11.0	18.4	---	--	56	177	---
S71-Oreg.	4-11	2.68	---	---	6.3	5.1	0.6	0.1	0.5	6.7	8.8	---	--	48	82	---
17-1 (1-6)[2]	11-19	0.81	---	---	6.0	3.4	0.6	0.1	0.4	4.9	5.9	---	--	47	21	---
	19-31	---	---	---	6.0	4.1	0.9	0.1	0.3	4.0	6.4	---	--	58	9	---
	31-36	---	---	---	5.8	7.8	2.2	0.1	0.3	4.0	7.4	---	--	72	--	---
	36-46	---	---	---	5.7	9.5	2.5	0.1	0.2	4.5	---	---	--	73	--	---

See footnotes at end of table.

TABLE 18.--CHEMICAL CHARACTERISTICS OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Organic matter	Organic carbon	Extractable iron	pH in water 1:1	Extractable cations (milliequivalents per 100 grams of soil)				Extractable acidity	Cation exchange capacity		Base saturation		Extractable phosphorus (parts per million)	Clay mineralogy[1]
						Ca	Mg	Na	K		NH_4OAc	Sum	NH_4OAc	Sum		
	In	Pct	Pct	Pct							Pct	Pct	Pct	Pct		
Tethrick gravelly fine sandy loam---	0-4	2.30	---	---	---	4.4	0.6	0	0.6	---	11.3	---	--	46	--	---
S73-Oreg.	4-9	1.00	---	---	---	2.2	0.4	0	0.5	---	8.3	---	--	48	--	---
17-1 (1-5)[2]	9-15	0.57	---	---	---	3.5	0.5	0	0.6	---	7.8	---	--	48	--	---
	15-30	0.21	---	---	---	2.7	0.6	0	0.5	---	7.3	---	--	52	--	---
	30-53	0.21	---	---	---	4.2	0.8	0	0.4	---	7.3	---	--	74	--	---
	53-60															

[1] Clay minerals are coded as follows: VR - vermiculite, KK - kaolinite, MI - mica; 1 - trace, 2 - small, 3 - moderate.
[2] Analyses were made at the Oregon Soil Characterization Laboratory, Oregon State University, Corvallis, Oregon.
[3] Analyses were made at the Soil Survey Laboratory, Soil Conservation Service, Riverside, California.

TABLE 19.--ENGINEERING INDEX TEST DATA FOR SELECTED SOILS

[Analyses were made at the West Technical Service Center, Engineering and Watershed Planning Soil Mechanics Laboratory, Soil Conservation Service, Portland, Oregon. Dashes indicate that no determination was made]

Soil name and sample number	Depth[1]	Percentage passing sieve number--				Moisture-density		Liquid limit	Plasticity index[2]
		4	10	40	200	Maximum dry density	Optimum moisture		
	In					Lb per ft^3	Pct		
Holland sandy loam (720635)	0-8	100	97	73	41	110.5	15.4	--	NP
Holland sandy loam (720638)	14-28	100	97	73	45	109.9	15.9	32	9
Josephine gravelly loam---------- (700193)	3-9	80	67	53	45	93.2	25.8	45	15
Josephine gravelly loam---------- (700194)	16-23	69	61	53	45	99.0	22.9	39	15
Siskiyou gravelly sandy loam------- (720639)	11-36	100	89	53	27	113.0	15.2	--	NP
Tethrick gravelly fine sandy loam-- (760134)	0-9	95	89	71	39	106.1	18.5	--	NP
Tethrick gravelly fine sandy loam-- (760135)	15-30	98	97	81	43	---	---	--	NP

[1] Some soil horizons of similar materials have been combined in making the determinations.
[2] NP = Nonplastic.

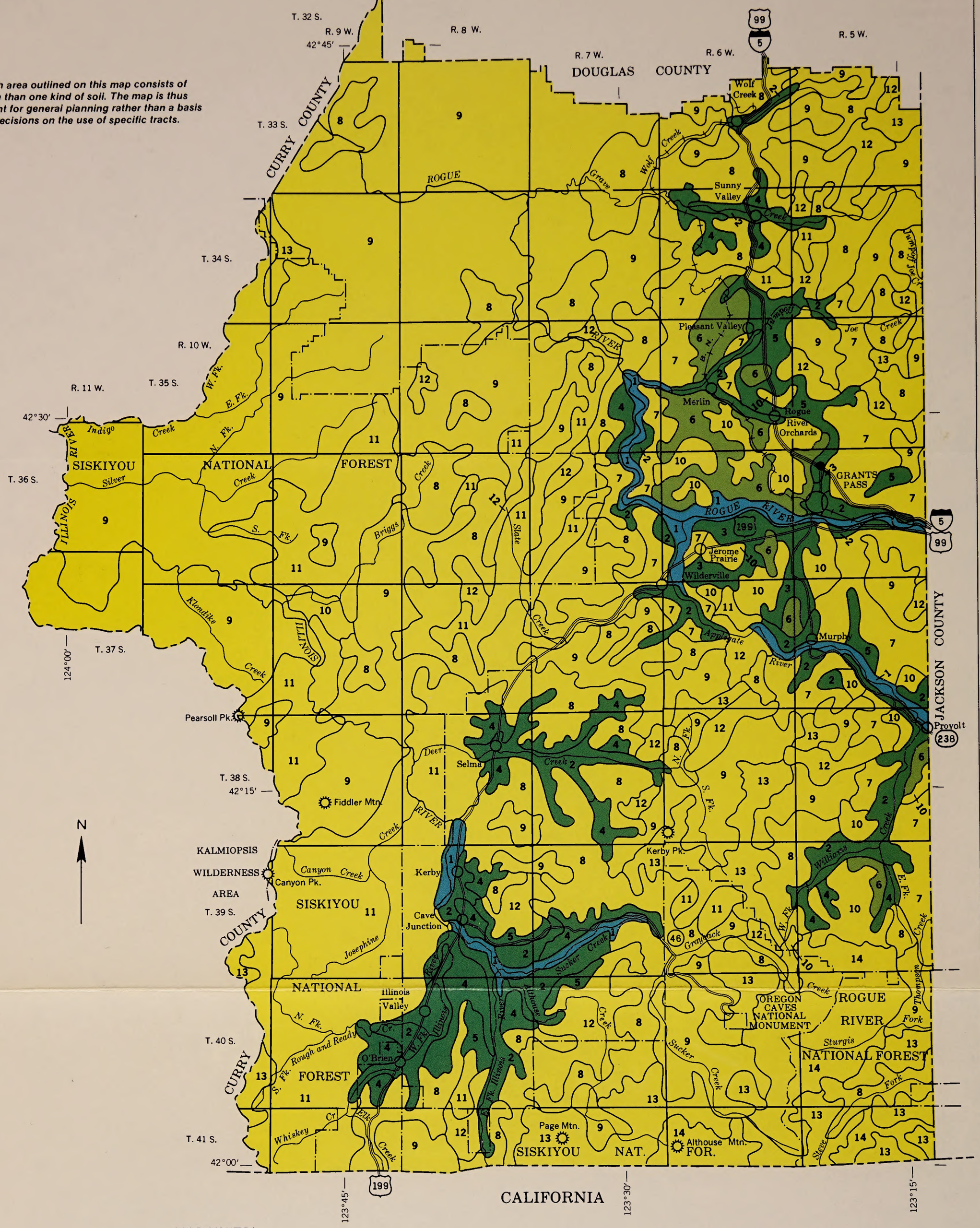
TABLE 20.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Abegg	Loamy-skeletal, mixed, mesic Ultic Haploxeralfs
Althouse	Loamy-skeletal, mixed, frigid Dystric Xerochrepts
Banning	Fine-loamy, mixed, mesic Pachic Argixerolls
Barron	Coarse-loamy, mixed, mesic Typic Xerochrepts
Beekman	Loamy-skeletal, mixed, mesic Typic Xerochrepts
Bigelow	Loamy-skeletal, mixed Entic Cryumbrepts
Brockman	Fine, serpentinitic, mesic Typic Xerochrepts
Brockman Variant	Fine-loamy, serpentinitic, mesic Typic Xerochrepts
Camas	Sandy-skeletal, mixed, mesic Fluventic Haploxerolls
Central Point	Coarse-loamy, mixed, mesic Pachic Haploxerolls
Clawson	Coarse-loamy, mixed, nonacid, mesic Typic Haplaquepts
Colestine	Fine-loamy, mixed, mesic Typic Xerochrepts
Copsey	Fine, serpentinitic, mesic Vertic Haplaquolls
Cornutt	Fine, mixed, mesic Ultic Haploxeralfs
Cove	Fine, montmorillonitic, mesic Vertic Haplaquolls
Crannler	Loamy-skeletal, mixed Entic Cryumbrepts
Debenger	Fine-loamy, mixed, mesic Typic Xerochrepts
Dubakella	Clayey-skeletal, serpentinitic, mesic Mollic Haploxeralfs
Eightlar	Clayey-skeletal, serpentinitic, mesic Typic Xerochrepts
Evans	Coarse-loamy, mixed, mesic Cumulic Haploxerolls
Fantz	Loamy-skeletal, mixed, mesic Pachic Ultic Haploxerolls
Foehlin	Fine-loamy, mixed, mesic Typic Argixerolls
Goodwin	Loamy-skeletal, mixed, frigid Typic Xerumbrepts
Holland	Fine-loamy, mixed, mesic Ultic Haploxeralfs
Jayar	Loamy-skeletal, mixed, frigid Dystric Xerochrepts
Jerome	Coarse-loamy over clayey, mixed, nonacid, mesic Typic Haplaquepts
Josephine	Fine-loamy, mixed, mesic Typic Haploxerults
Jumpoff	Fine, mixed, mesic Ultic Haploxeralfs
Kerby	Fine-loamy, mixed, mesic Typic Xerochrepts
Knapke	Loamy-skeletal, mixed, mesic Entic Ultic Haploxerolls
Manita	Fine, mixed, mesic Mollic Haploxeralfs
McMullin	Loamy, mixed, mesic Lithic Ultic Haploxerolls
Newberg	Coarse-loamy, mixed, mesic Fluventic Haploxerolls
Pearsoll	Clayey-skeletal, serpentinitic, mesic Lithic Xerochrepts
Perdin	Fine, serpentinitic, frigid Ultic Haploxeralfs
Pollard	Clayey, kaolinitic, mesic Typic Haploxerults
Rogue	Coarse-loamy, mixed, frigid Dystric Xerochrepts
Ruch	Fine-loamy, mixed, mesic Typic Haploxeralfs
Selmac	Fine-loamy over clayey, mixed, mesic Ultic Haploxeralfs
Siskiyou	Coarse-loamy, mixed, mesic Typic Xerochrepts
Speaker	Fine-loamy, mixed, mesic Ultic Haploxeralfs
Takilma	Loamy-skeletal, mixed, mesic Ultic Haploxerolls
Takilma Variant	Loamy-skeletal, serpentintic, mesic Typic Xerochrepts
Tethrick	Coarse-loamy, mixed, mesic Dystric Xerochrepts
Vannoy	Fine-loamy, mixed, mesic Typic Haploxeralfs
Vermisa	Loamy-skeletal, mixed, mesic Lithic Xerochrepts
Voorhies	Loamy-skeletal, mixed, mesic Typic Haploxeralfs
Wapato	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
Witzel*	Loamy-skeletal, mixed, mesic Lithic Ultic Haploxerolls
Woodseye	Loamy-skeletal, mixed, frigid Lithic Xerumbrepts

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



MAP UNITS*

AREAS DOMINATED BY DEEP, WELL DRAINED TO EXCESSIVELY DRAINED SOILS ON FLOOD PLAINS

1 Newberg-Camas-Evans: Deep, well drained to excessively drained fine sandy loam, gravelly sandy loam, and loam

AREAS DOMINATED BY DEEP, WELL DRAINED TO SOMEWHAT POORLY DRAINED SOILS ON LOW STREAM TERRACES, ALLUVIAL FANS, AND HILLSIDES AND IN DRAINAGEWAYS

2 Takilma-Foehlin-Kerby: Deep, well drained cobbly loam, gravelly loam, and loam

3 Clawson-Jerome: Deep, somewhat poorly drained sandy loam

4 Pollard-Abegg: Deep, well drained loam and gravelly loam

5 Brockman: Deep, moderately well drained cobbly clay loam and clay loam

AREAS DOMINATED BY MODERATELY DEEP AND DEEP, WELL DRAINED AND SOMEWHAT EXCESSIVELY DRAINED SOILS ON HILLSIDES, TOE SLOPES, AND ALLUVIAL FANS

6 Holland-Barron-Siskiyou: Deep and moderately deep, well drained and somewhat excessively drained sandy loam, coarse sandy loam, and gravelly sandy loam

AREAS DOMINATED BY SHALLOW TO DEEP, MODERATELY WELL DRAINED TO SOMEWHAT EXCESSIVELY DRAINED SOILS ON MOUNTAINSIDES, HILLSIDES, RIDGES, ALLUVIAL FANS, AND STREAM TERRACES

7 Vannoy-Manita-Voorhies; Deep and moderately deep, well drained silt loam, loam, and very gravelly loam

8 Joesphine-Speaker-Pollard: Deep and moderately deep, well drained gravelly loam and loam

9 Beekman-Vermisa-Colestine: Moderately deep and shallow, well drained and somewhat excessively drained, extremely gravelly loam and gravelly loam

10 Siskiyou-Tethrick: Deep and moderately deep, somewhat excessively drained and well drained gravelly sandy loam and gravelly fine sandy loam

11 Pearsoll-Dubakella-Eightlar: Shallow to deep, well drained and moderately well drained extremely stony clay loam, very cobbly clay loam, and extremely stony clay

12 Cornutt-Dubakella: Deep and moderately deep, well drained cobbly clay loam and very cobbly clay loam

13 Jayar-Althouse: Moderately deep and deep, well drained very gravelly loam and very gravelly silt loam

14 Crannler-Goodwin-Rogue: Moderately deep and deep, somewhat excessively drained and well drained very stony sandy loam and stony coarse sandy loam

*Terms for texture refer to the dominant texture of the surface layer of the major soils.

Compiled 1981

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

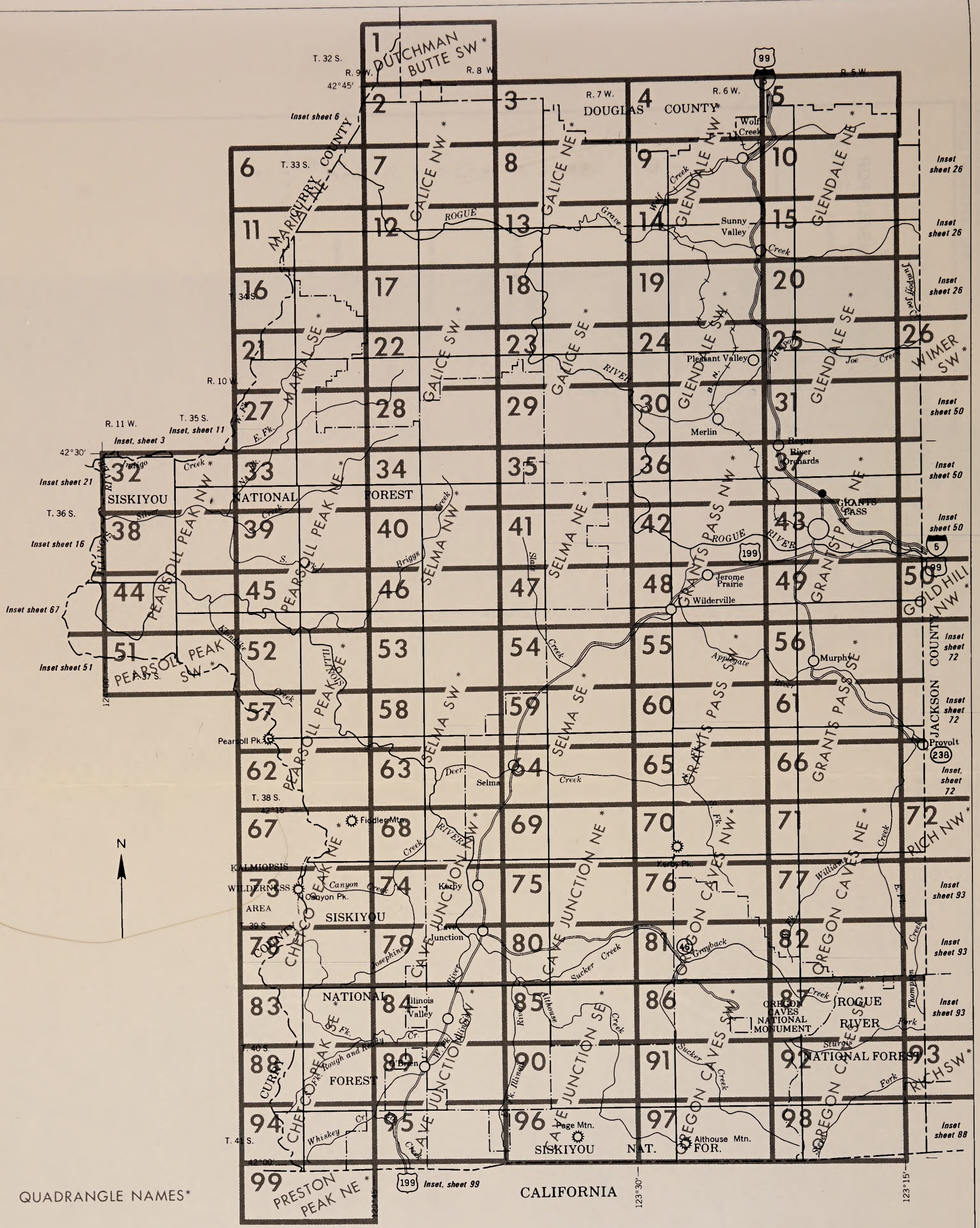
OREGON AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

JOSEPHINE COUNTY, OREGON

Scale 1: 316,800

1 0 1 2 3 4 5 Miles



QUADRANGLE NAMES*

INDEX TO MAP SHEETS

JOSEPHINE COUNTY, OREGON

Scale 1: 318,800

1 0 1 2 3 4 5 Miles

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE

JOSEPHINE COUNTY, OREGON

U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

SYMBOL	NAME
1B	Abegg gravelly loam, 2 to 7 percent slopes
1C	Abegg gravelly loam, 7 to 12 percent slopes
1D	Abegg gravelly loam, 12 to 20 percent slopes
2F	Althouse very gravelly silt loam, 35 to 75 percent north slopes*
3F	Althouse very gravelly silt loam, 35 to 75 percent south slopes*
4	Banning loam
5B	Barron coarse sandy loam, 2 to 7 percent slopes
5C	Barron coarse sandy loam, 7 to 12 percent slopes
6F	Beekman-Colestine complex, 50 to 80 percent north slopes*
7F	Beekman-Colestine complex, 50 to 75 percent south slopes*
8G	Beekman-Vermisa complex, 60 to 100 percent north slopes*
9G	Beekman-Vermisa complex, 60 to 100 percent south slopes*
10E	Bigelow very gravelly sandy loam, 5 to 35 percent slopes*
10F	Bigelow very gravelly sandy loam, 35 to 65 percent slopes*
11B	Brockman clay loam, 2 to 7 percent slopes
11C	Brockman clay loam, 7 to 12 percent slopes
12B	Brockman cobbly clay loam, 2 to 7 percent slopes
12D	Brockman cobbly clay loam, 7 to 20 percent slopes
13	Brockman Variant very gravelly loam
14	Camas gravelly sandy loam
15	Camas-Newberg complex
16	Central Point sandy loam
17B	Clawson sandy loam, 2 to 7 percent slopes
18A	Copsey clay, 0 to 3 percent slopes
18B	Copsey clay, 3 to 7 percent slopes
19D	Cornutt-Dubakella complex, 7 to 20 percent slopes*
19E	Cornutt-Dubakella complex, 20 to 35 percent slopes*
20F	Cornutt-Dubakella complex, 35 to 55 percent north slopes*
21F	Cornutt-Dubakella complex, 35 to 55 percent south slopes*
22	Cove silty clay loam
23G	Crannler very stony sandy loam, 50 to 90 percent slopes*
24G	Crannler-Rock outcrop complex, 50 to 100 percent slopes*
25E	Cryaquepts, 0 to 30 percent slopes*
26F	Cryumbrepts, very steep*
27C	Debenger loam, 7 to 12 percent slopes
27D	Debenger loam, 12 to 20 percent slopes
28F	Dubakella-Pearsoll complex, 35 to 75 percent north slopes*
29F	Dubakella-Pearsoll complex, 35 to 70 percent south slopes*
30	Dumps
31D	Eightlar extremely stony clay, 5 to 20 percent slopes*
31E	Eightlar extremely stony clay, 20 to 35 percent slopes*
32F	Eightlar-Dubakella complex, 35 to 65 percent north slopes*
33F	Eightlar-Dubakella complex, 35 to 65 percent south slopes*
34	Evans loam
35F	Fantz-Knapke complex, 35 to 85 percent north slopes*
36F	Fantz-Knapke complex, 35 to 85 percent south slopes*
37G	Fantz-Rock outcrop complex, 60 to 100 percent slopes*
38A	Foehlin gravelly loam, 0 to 3 percent slopes
38C	Foehlin gravelly loam, 3 to 12 percent slopes
39D	Goodwin very stony sandy loam, 5 to 35 percent slopes*
40F	Goodwin very stony sandy loam, 35 to 65 percent north slopes *
41F	Goodwin very stony sandy loam, 35 to 65 percent south slopes*
42B	Holland sandy loam, cool, 2 to 7 percent slopes
42C	Holland sandy loam, cool, 7 to 12 percent slopes
42D	Holland sandy loam, cool, 12 to 20 percent slopes
42E	Holland sandy loam, cool, 20 to 35 percent slopes
43E	Jayar very gravelly loam, 20 to 35 percent slopes*
44F	Jayar very gravelly loam, 35 to 70 percent north slopes*
45F	Jayar very gravelly loam, 35 to 70 percent south slopes*
46	Jerome sandy loam
47E	Josephine gravelly loam, 20 to 35 percent slopes*
48F	Josephine gravelly loam, 35 to 55 percent north slopes*
49D	Jumpoff clay loam, 7 to 20 percent slopes*
49E	Jumpoff clay loam, 20 to 35 percent slopes*
50F	Jumpoff clay loam, 35 to 50 percent north slopes*
51F	Jumpoff clay loam, 35 to 50 percent south slopes*
52	Kerby loam
53B	Manita loam, 2 to 7 percent slopes
53C	Manita loam, 7 to 12 percent slopes
53D	Manita loam, 12 to 20 percent slopes
53E	Manita loam, 20 to 35 percent slopes
54F	Manita loam, 35 to 50 percent north slopes*
55F	Manita loam, 35 to 50 percent south slopes*
56F	McMullin gravelly loam, 30 to 60 percent slopes*
57	Newberg fine sandy loam
58F	Pearsoll-Rock outcrop complex, 20 to 60 percent slopes*
58G	Pearsoll-Rock outcrop 60 to 90 percent slopes*
59F	Perdin cobbly loam, 30 to 50 percent north slopes*
60F	Perdin cobbly loam, 30 to 50 percent south slopes*
61B	Pollard loam, 2 to 7 percent slopes
61C	Pollard loam, 7 to 12 percent slopes
61D	Pollard loam, 12 to 20 percent slopes
61E	Pollard loam, 20 to 35 percent slopes
62F	Pollard gravelly loam, 35 to 50 percent slopes*
63F	Pollard-Beekman complex, 12 to 70 percent slopes*
64	Riverwash
65F	Rogue-Goodwin complex, 35 to 70 percent north slopes*
66F	Rogue-Goodwin complex, 35 to 70 percent south slopes*
67B	Ruch gravelly silt loam, 2 to 7 percent slopes
67C	Ruch gravelly silt loam, 7 to 12 percent slopes
68B	Selmac loam, 2 to 7 percent slopes
68D	Selmac loam, 7 to 20 percent slopes
69E	Siskiyou gravelly sandy loam, 20 to 35 percent slopes*
70F	Siskiyou gravelly sandy loam, 35 to 70 percent north slopes*
71F	Siskiyou gravelly sandy loam, 35 to 60 percent south slopes*
72F	Speaker-Josephine gravelly loams, 35 to 55 percent south slopes*
73	Takilma cobbly loam
74	Takilma Variant extremely cobbly loam
75F	Tethrick gravelly fine sandy loam, 45 to 70 percent north slopes*
76F	Tethrick gravelly fine sandy loam, 45 to 65 percent south slopes*
77E	Vannoy silt loam, 20 to 35 percent slopes*
78F	Vannoy silt loam, 35 to 55 percent north slopes*
79F	Vannoy-Voorhies complex, 35 to 55 percent south slopes*
80G	Vermisa-Beekman complex, 60 to 100 percent north slopes*
81G	Vermisa-Beekman complex, 60 to 100 percent south slopes*
82G	Vermisa-Rock outcrop complex, 60 to 100 percent south slopes*
83	Wapato silt loam
84F	Witzel-Rock outcrop complex, 30 to 75 percent slopes*
85G	Woodseye very gravelly loam, 50 to 90 percent south slopes*
86G	Woodseye-Jayar complex, 50 to 90 percent north slopes*
87F	Woodseye-Rock outcrop complex, 20 to 60 percent slopes*

*Broadly defined mapping units

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool (Davis Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- Interstate (78)
- Federal (410)
- State (52)
- County, farm or ranch (378)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small (water; w)

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (GAS)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (67C / 1B)

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

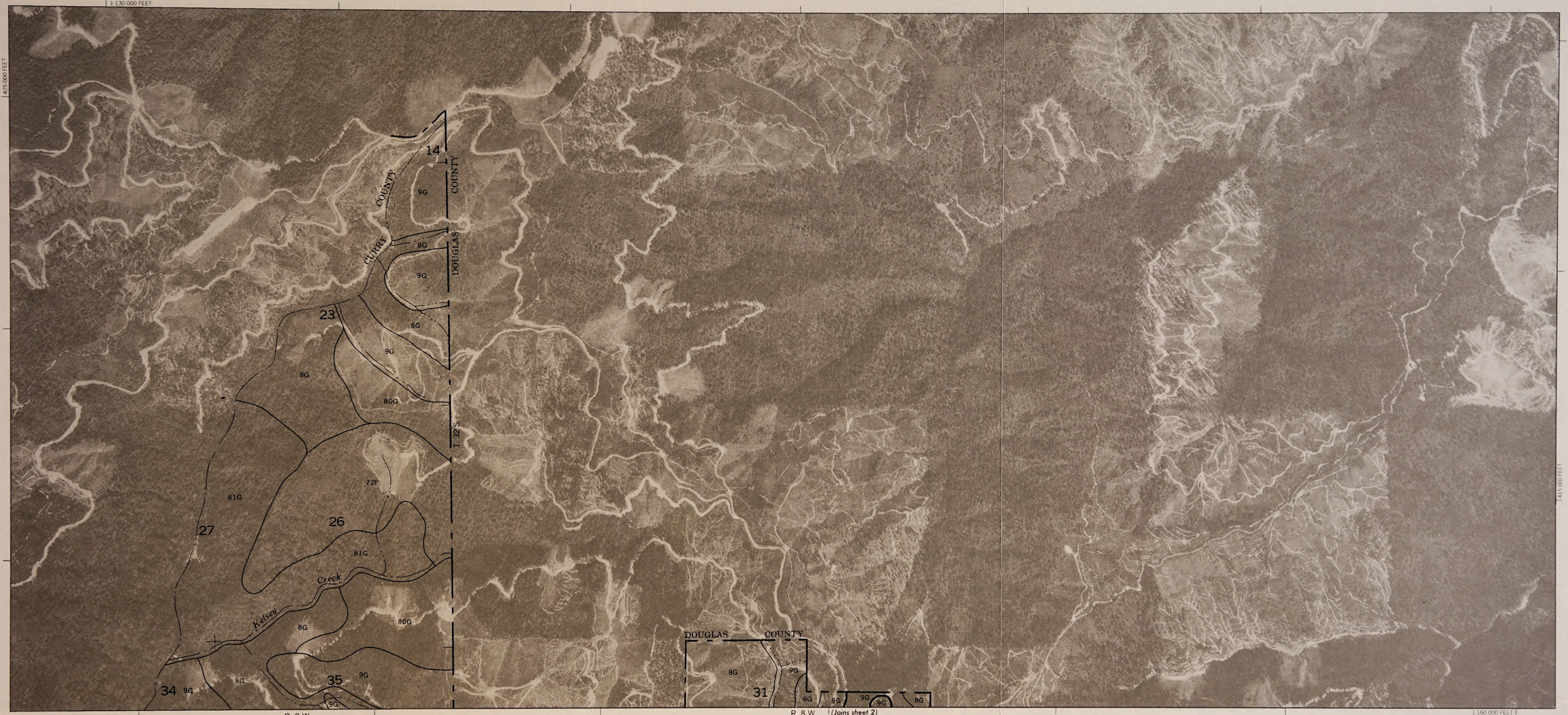
DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Buried cable
- Lookout

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 1



N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 2

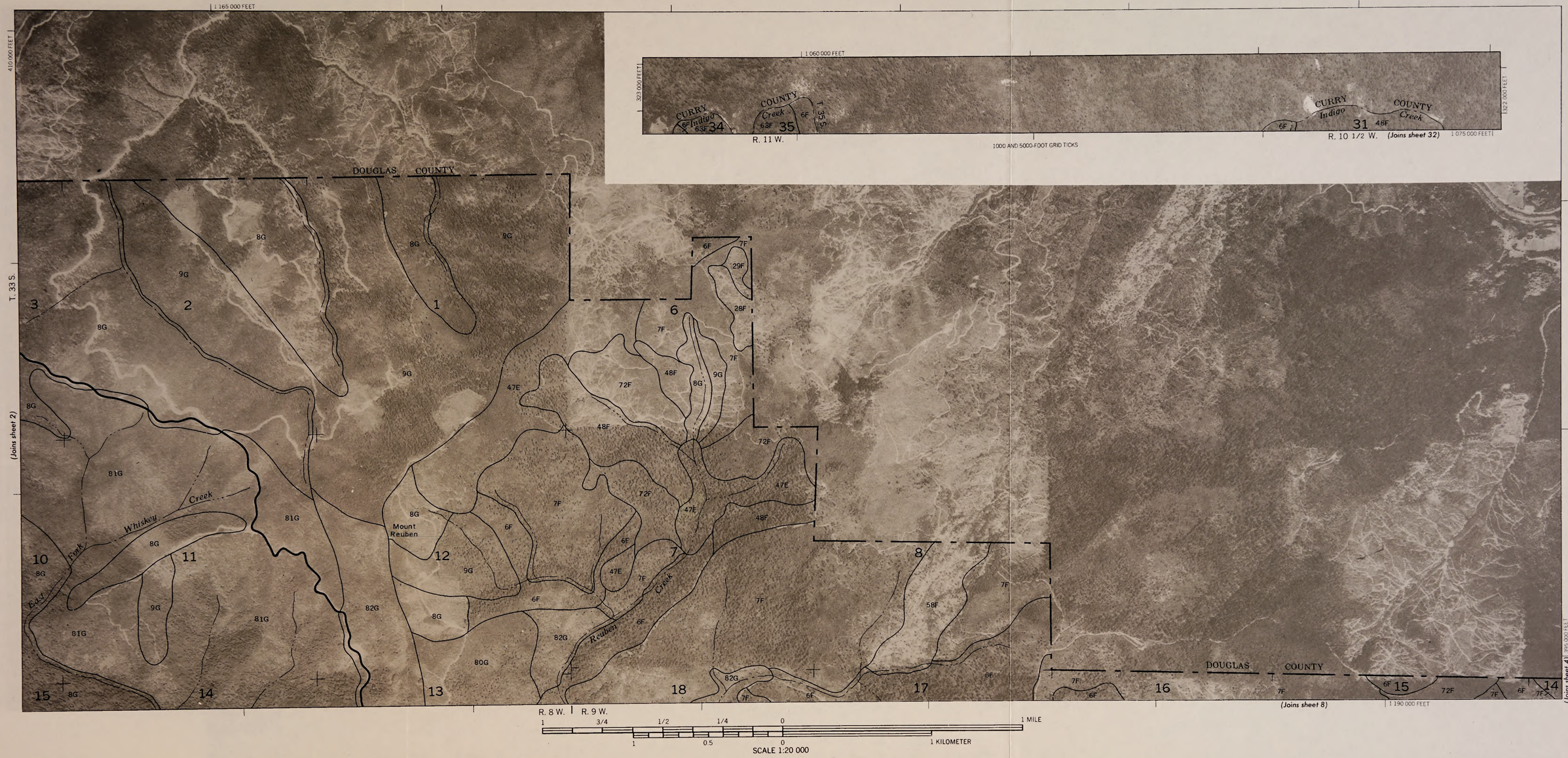


1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N


1 165 000 FEET
410 000 FEET
T. 33 S.
(Joins sheet 2)
DOUGLAS COUNTY
1 060 000 FEET
323 000 FEET
CURRY COUNTY
Indigo Creek
34
35
T. 35 S.
R. 11 W.
1000 AND 5000-FOOT GRID TICKS
31
R. 10 1/2 W.
(Joins sheet 32)
1 075 000 FEET
322 000 FEET
Whiskey Creek
Mount Reuben
East Fork
Reuben Creek
R. 8 W.
R. 9 W.
DOUGLAS COUNTY
(Joins sheet 8)
1 190 000 FEET
(Joins sheet 4) 395 000 FEET
1 MILE
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000

N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 4



1 3/4 1/2 1/4 0 1 MILE

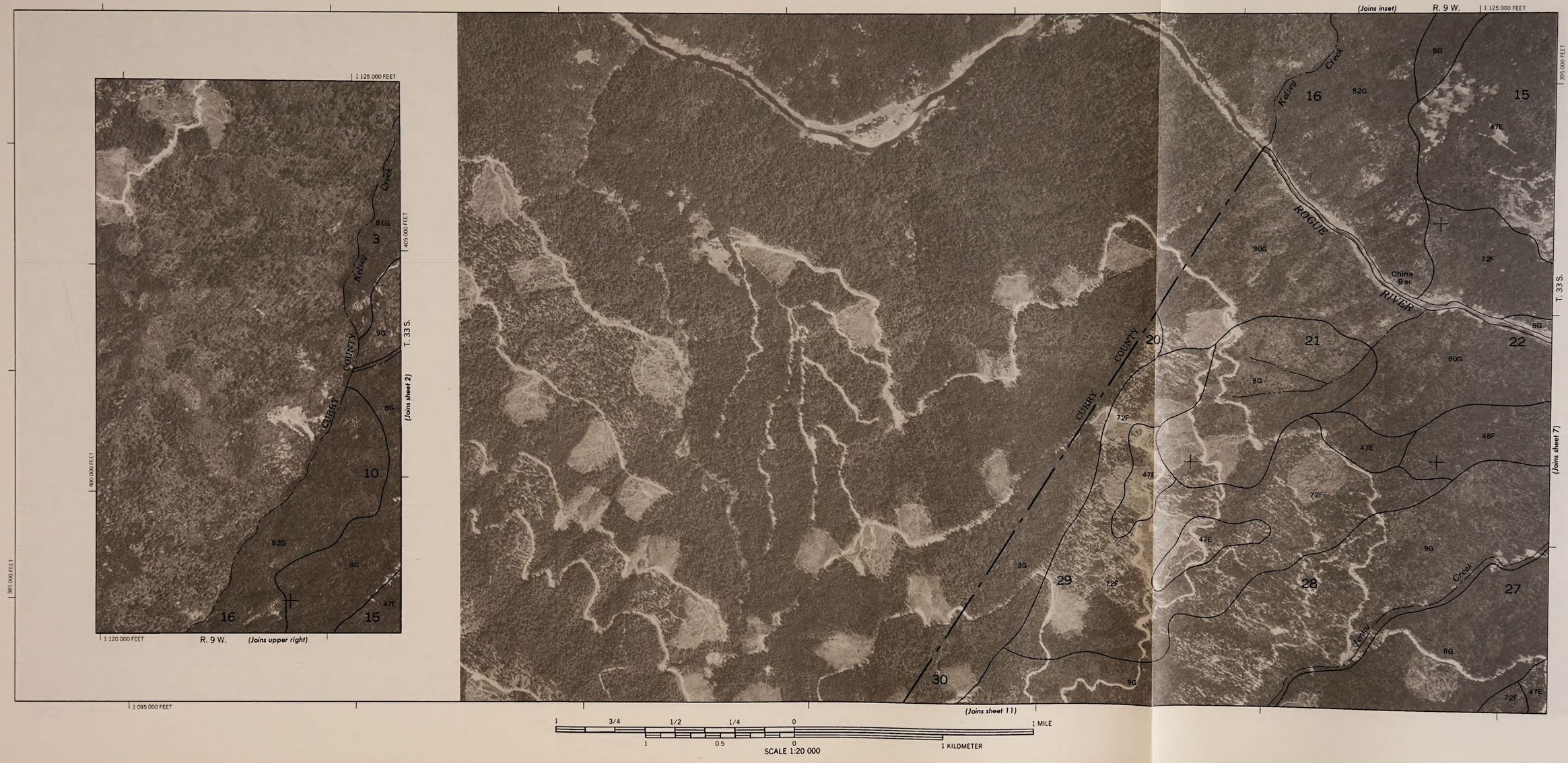
1 0.5 0 1 KILOMETER

SCALE 1:20 000

N


1 230 000 FEET
405 000 FEET
DOUGLAS COUNTY
DOUGLAS COUNTY
Stage Road
Sourdough Gulch
Wolf Creek
Beard Tree Creek
Elvan Gulch
Bear Gulch
China Gulch
Burnner Gulch
T. 33 S.
(Joins sheet 4)
R. 6 W.
R. 5 W.
395 000 FEET
1 260 000 FEET
(Joins sheet 10)
(Joins inset A, sheet 26)
1 MILE
1 KILOMETER
SCALE 1:20 000

N


1 125 000 FEET
405 000 FEET
400 000 FEET
395 000 FEET
385 000 FEET
1 120 000 FEET
1 095 000 FEET
R. 9 W.
(Joins upper right)
(Joins inset)
(Joins sheet 2)
(Joins sheet 7)
(Joins sheet 11)
T. 33 S.
Kelsey Creek
COUNTY
CURRY
ROGUE
RIVER
China Bar
Jenny Creek
81G
82G
80G
9G
8G
72F
47E
48F
3
10
16
15
20
21
22
29
28
27
30
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N


(Joins sheet 3)
R. 8 W.
R. 7 W.
1 190 000 FEET
(Joins sheet 7)
385 000 FEET
390 000 FEET
T. 33 S.
(Joins sheet 9)
1 160 000 FEET
(Joins sheet 13)
Whiskey Creek
East Fork
Sawmill Gap
Hungry Hill
Creek
Drain
Reuben
Creek
Creek
Peavmaan
Creek
Rock
Jay Creek
California Gulch
15
14
13
18
17
16
22
23
24
19
20
21
27
26
25
30
29
28
81G
82G
80G
72F
7F
6F
48F
47E
62F
21F
61E
1 MILE
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000


N
1 195 000 FEET
390 000 FEET
T. 33 S.
(Joins sheet 8)
(Joins sheet 4)
(Joins sheet 10)
(Joins sheet 14)
1 225 000 FEET
380 000 FEET
DOUGLAS COUNTY
Poorman Creek
Ramsey Gulch
Farmer Gulch
Water Tank
Berglund Gulch
Hughes Gulch
Wolf Creek
Coyote Creek
Malone Peak
London Peak
Sugarloaf
Bear Gulch
SOUTHERN PACIFIC
Wolf Creek
R. 7 W.
R. 6 W.
1 MILE
1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 10



N





1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 12



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


1 160 000 FEET
R. 8 W. | R. 7 W.
(Joins sheet 8)
980 000 FEET
T. 34 S. | T. 33 S.
(Joins sheet 12)
(Joins sheet 14)
ROGUE
RIVER
Reuben
Creek
Rock
Granite
Alex
Gulch
Chinn
Gulch
Mouse
Creek
McNabb
Creek
Poorman
Creek
Dry
Creek
Fall
Creek
Butte
Creek
(Joins sheet 18)
1 190 000 FEET
965 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000

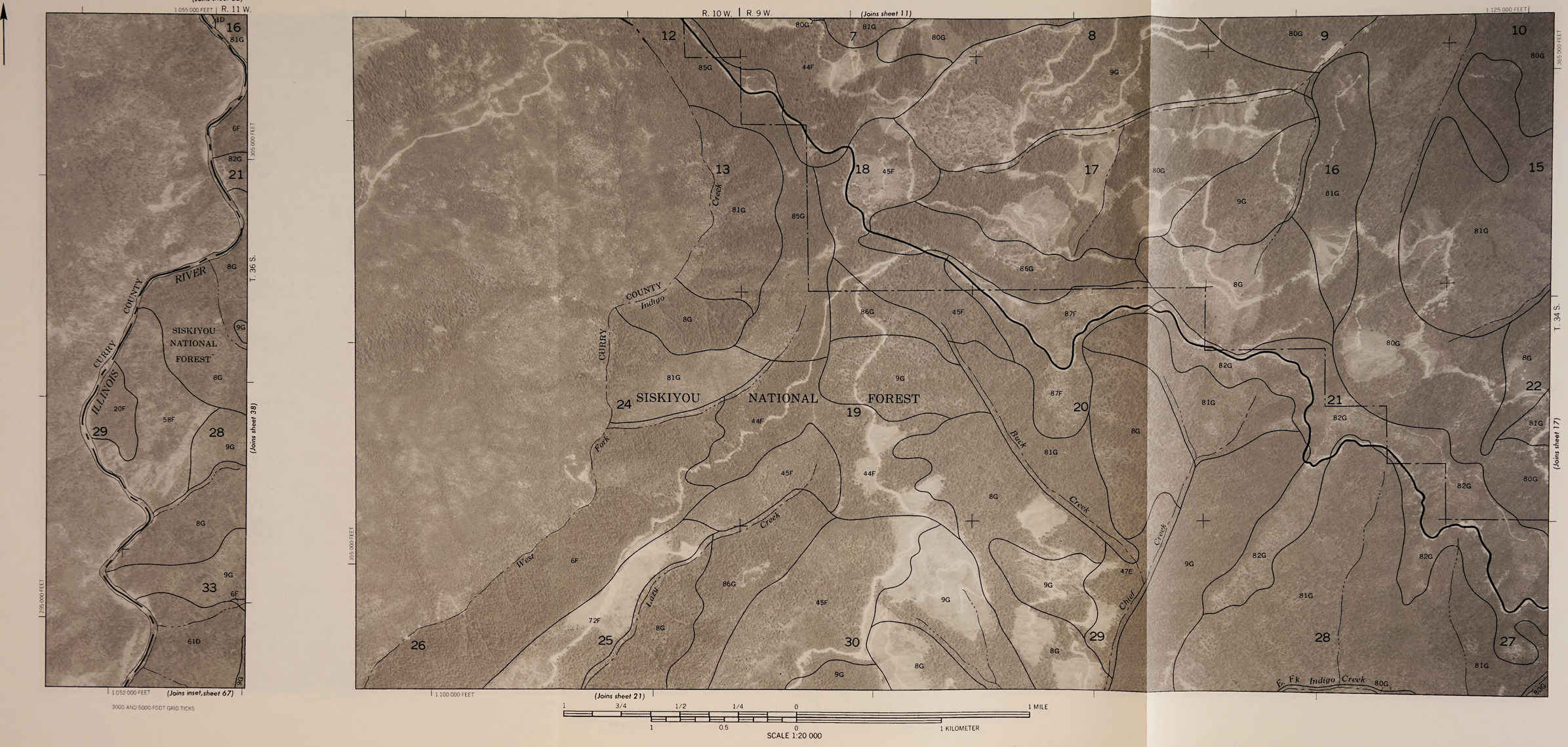
N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 14




R. 6 W.
R. 5 W.
1 230 000 FEET
(Joins sheet 10)
375 000 FEET
T. 33 S.
T. 34 S.
(Joins sheet 14)
(Joins inset B, sheet 26)
365 000 FEET
(Joins sheet 20)
1 255 000 FEET
Kennedy Gulch
Miller Gulch
Bear Creek
St. Paul Mtn.
Clark Creek
Eastman Gulch
Salmon Creek
Bear Creek
Mill Gulch
Quartz Creek
Benjamin Gulch
Tom Creek
Grave Creek
Shirttail Creek
1 MILE
1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 16





1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 18




1 195 000 FEET
R. 7 W.
R. 6 W.
(Joins sheet 14)
T. 34 S.
350 000 FEET
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 24)
1 225 000 FEET
N
Brimstone Gulch
East Fork
Dog Creek
Mill Creek
Rum Creek
Hog Creek
Bummer Creek
SOUTHERN PACIFIC
Hugo
99
5
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


N
R. 6 W.
R. 5 W.
(Joins sheet 15)
1 260 000 FEET
360 000 FEET
T. 34 S.
(Joins sheet 19)
(Joins inset C sheet 26)
350 000 FEET
1 230 000 FEET
(Joins sheet 25)
Shanks Gulch
Burgess Gulch
Creek
Sexton Mtn.
Shorthorn Gulch
Horse Creek
Jack Creek
Breakdown Creek
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


1 095 000 FEET
R. 10 W.
R. 9 W.
(Joins sheet 16)
350 000 FEET
T. 35 S.
T. 34 S.
CURRY
JOSEPHINE COUNTY
SISKIYOU
NATIONAL
FOREST
West Fork
Lizard
East Fork
Indian
Hobson Road
Creek
Sourgrass
(Joins sheet 22)
340 000 FEET
(Joins sheet 27)
1 120 000 FEET
N
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 22




1 160 000 FEET
R. 8 W. | R. 7 W.
(Joins sheet 18)
N
T. 34 S. | T. 35 S.
345 000 FEET
(Joins sheet 22)
(Joins sheet 24)
335 000 FEET
Rocky Gulch
Rich Gulch
Blanchard Gulch
Galice Creek
ROGUE RIVER
Stratton Creek
Sic Creek
Taylor Creek
Hellgate Canyon
SISKIYOU NATIONAL FOREST
(Joins sheet 29)
1 190 000 FEET
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 24





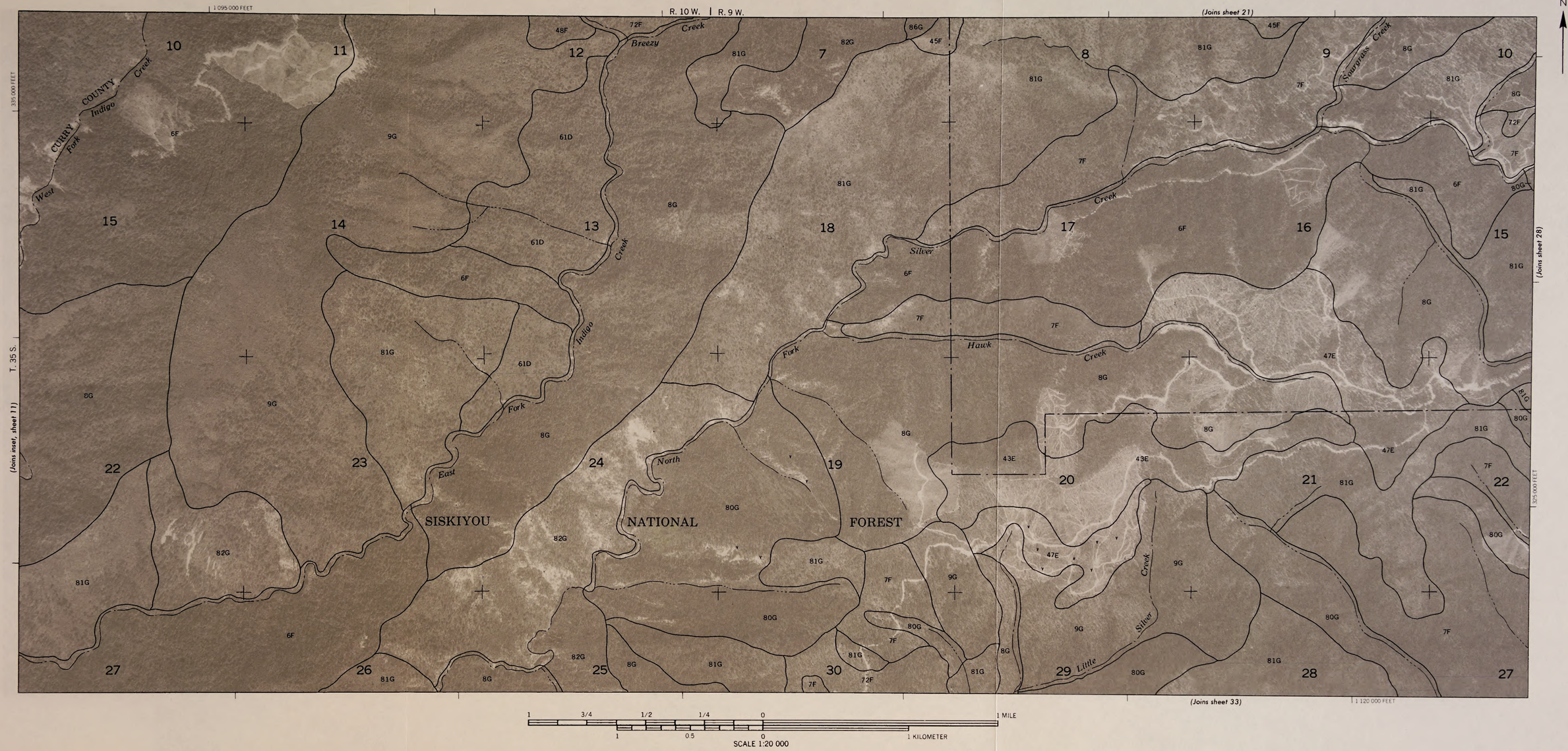
1 MILE 3/4 1/2 1/4 0

1 0.5 0 1 KILOMETER

SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 26




1 095 000 FEET
R. 10 W.
R. 9 W.
(Joins sheet 21)
N
335 000 FEET
T. 35 S.
(Joins inset, sheet 11)
(Joins sheet 28)
325 000 FEET
(Joins sheet 33)
1 120 000 FEET
CURRY COUNTY
West Fork Indigo Creek
Breezy Creek
Silver Creek
Hawk Creek
Indigo Fork
North Fork
East Fork
Little Silver Creek
SISKIYOU NATIONAL FOREST
10
11
12
7
8
9
15
14
13
18
17
16
22
23
24
19
20
21
27
26
25
30
29
28
6F
9G
61D
48F
72F
82G
86G
45F
81G
8G
7F
80G
47E
43E
1 MILE
1 KILOMETER
SCALE 1:20 000

N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 28

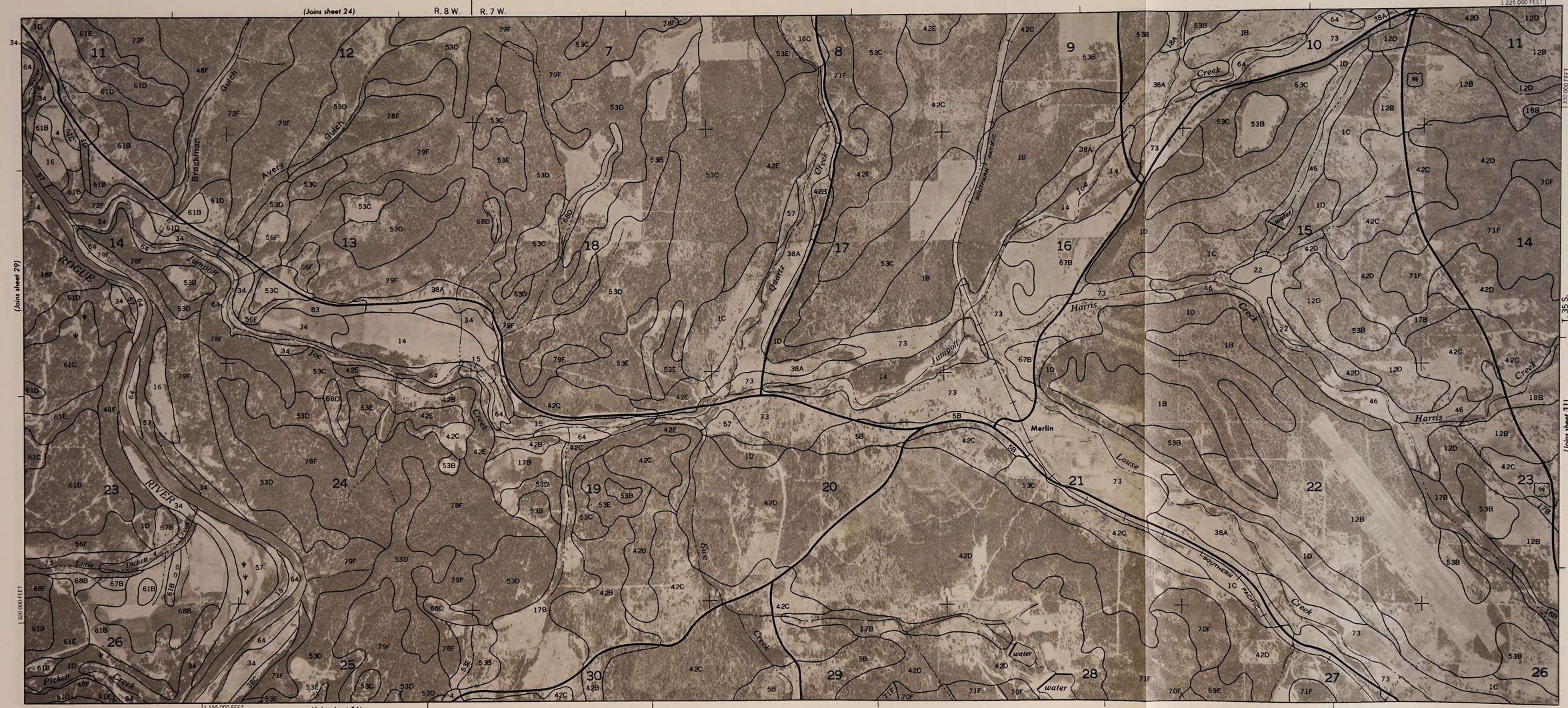




1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

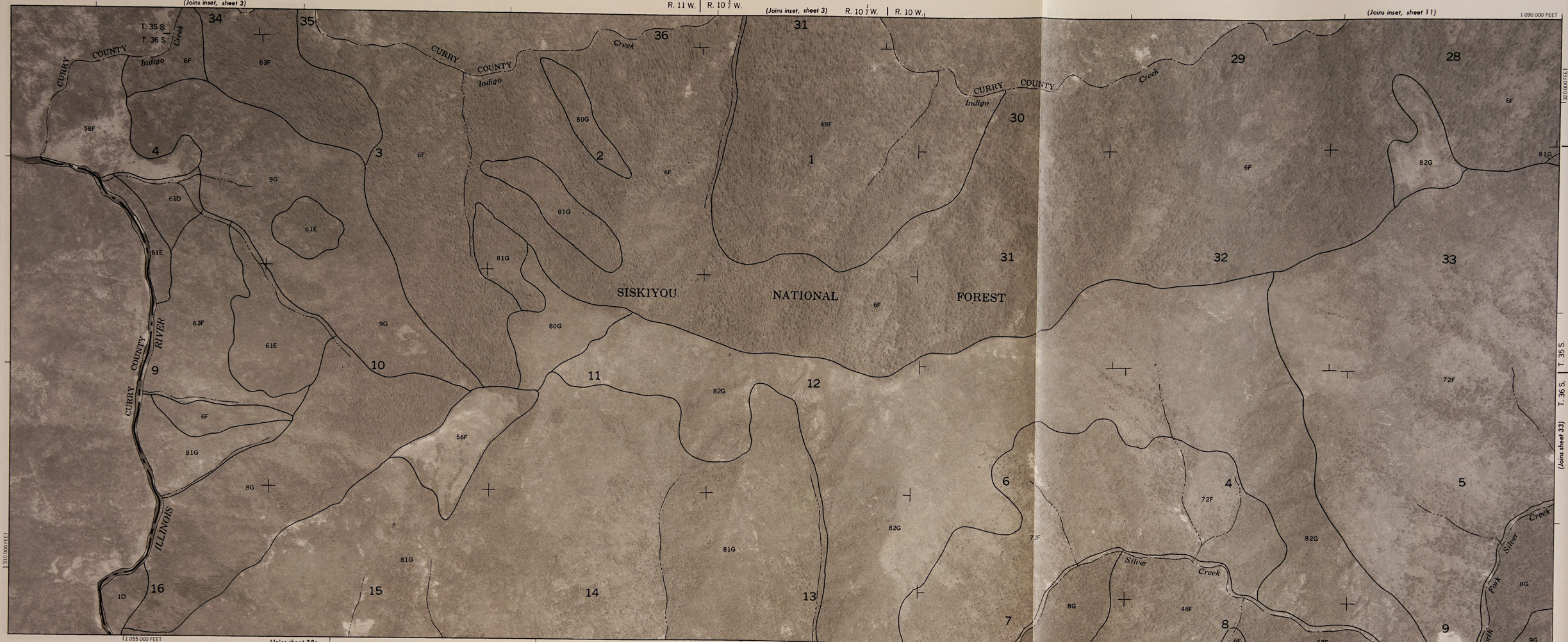
SCALE 1:20 000


N
(Joins sheet 24)
R. 8 W.
R. 7 W.
1 225 000 FEET
1 330 000 FEET
T. 35 S.
(Joins sheet 29)
(Joins sheet 31)
1 320 000 FEET
1 195 000 FEET
(Joins sheet 36)
Brackman Gulch
Avery Gulch
Jumpoff Creek
ROGUE RIVER
Quartz Creek
Jump off Creek
Harris Creek
Louse Creek
Little Pickett Creek
Pickett Creek
Merlin
SOUTHERN PACIFIC
water
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


1 230 000 FEET
R. 6 W.
R. 5 W.
(Joins sheet 25)
330 000 FEET
T. 35 S.
(Joins sheet 30)
(Joins inset , sheet 50)
320 000 FEET
1 255 000 FEET
(Joins sheet 37)
Walker Mtn.
Elk Mtn.
Cove Creek
Morris Creek
Soldier Creek
Louse Creek
North Fork Louse Creek
N
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 32



SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 33



N

(Joins sheet 28)

R. 9 W. | R. 8 W.

1 155 000 FEET

315 000 FEET

T. 36 S. | T. 35 S.

(Joins sheet 35)

(Joins sheet 33)

310 000 FEET

1 125 000 FEET

(Joins sheet 40)



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

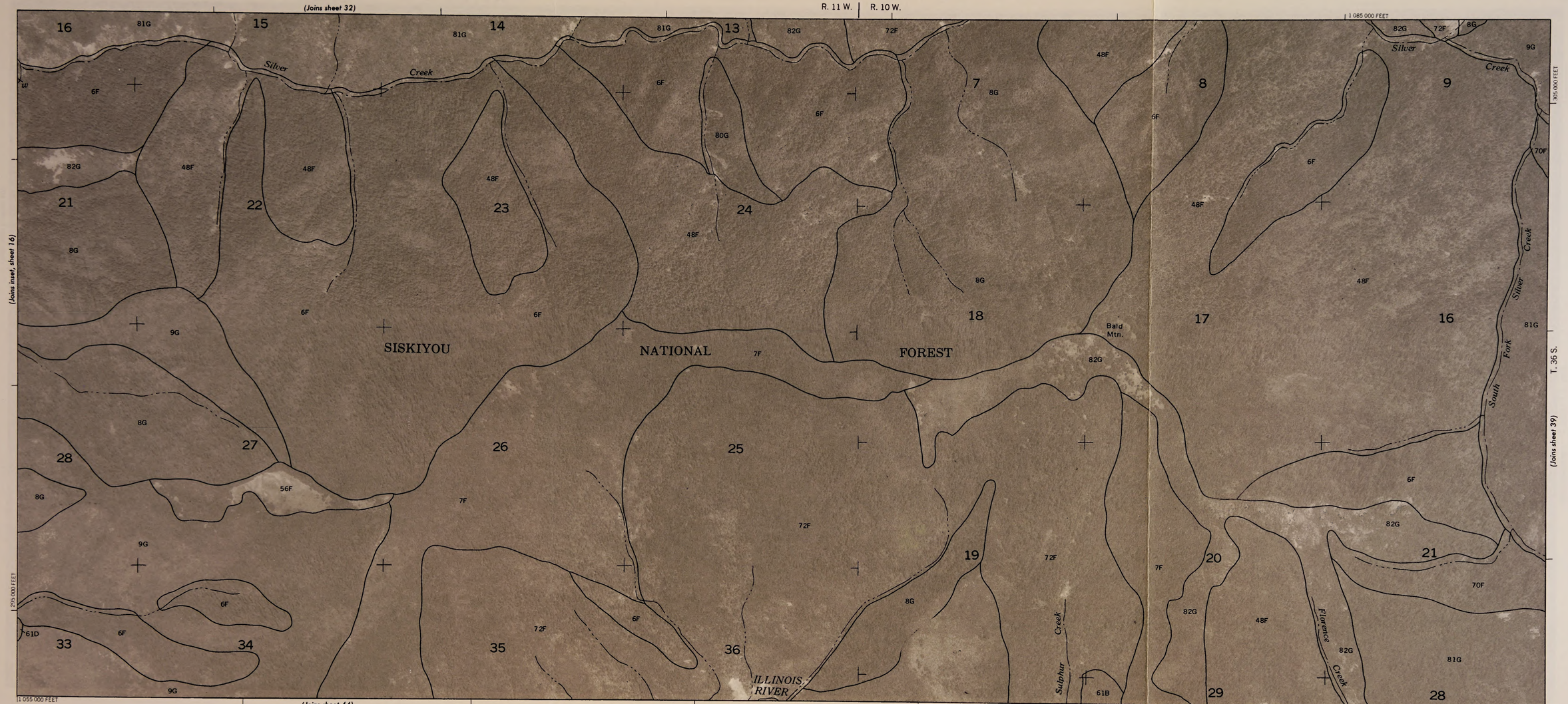
SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 36




1 225 000 FEET
R. 6 W. | R. 5 W.
(Joins sheet 31)
N
T. 36 S. | T. 35 S.
(Joins sheet 36)
(Joins inset B, sheet 50)
1 255 000 FEET
(Joins sheet 43)
Louse Creek
Soldier Creek
North Fork Louse Creek
Jones Creek
West Fork Jones Creek
Stuart Creek
Ditch
Pacific
Boundary
East Fork
1 MILE
1 KILOMETER
SCALE 1:20 000

N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 38



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N

R. 10 W. | R. 9 W.

1 090 000 FEET

305 000 FEET

(Joins sheet 33)

(Joins sheet 38)

(Joins sheet 40)

T. 36 S.

1 296 000 FEET

(Joins sheet 45)

1 120 000 FEET

Phillips Creek

Little Todd Creek

Todd Creek

Silver Creek

South Fork Silver Creek

Red Dog Creek

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N

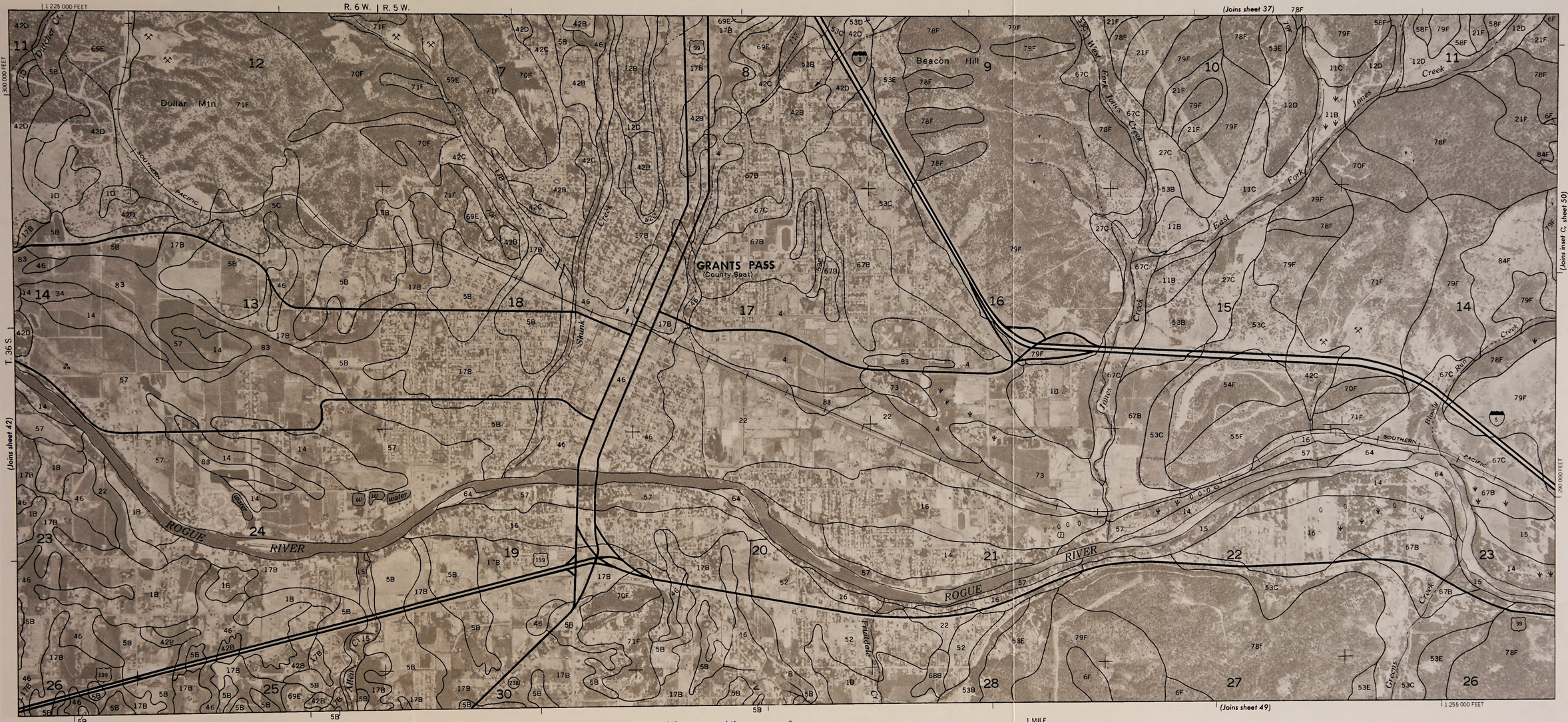
SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 40




1 160 000 FEET
R. 8 W.
R. 7 W.
(Joins sheet 35)
300 000 FEET
T. 36 S.
(Joins sheet 40)
(Joins sheet 42)
290 000 FEET
(Joins sheet 47)
1 190 000 FEET
N
SISKIYOU NATIONAL FOREST
Onion Mtn.
Taylor Creek
Shan Creek
Secret Creek
Slate Creek
Limpy Creek
Dutcher Creek
12B Creek
1 MILE
1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 42




R. 6 W.
R. 5 W.
1 225 000 FEET
1 255 000 FEET
300 000 FEET
T. 36 S.
(Joins sheet 42)
(Joins sheet 37)
(Joins inset C, sheet 50)
(Joins sheet 49)
GRANTS PASS
(County Seat)
Beacon Hill
Dollar Mtn.
Dutcher Cr.
SOUTHERN PACIFIC
ROGUE RIVER
Jones Creek
West Fork Jones Creek
East Fork Jones Creek
Shank Creek
Allen Cr.
Franklin Cr.
Grave Creek
Bloody Run Creek
water
N
1 MILE
1 KILOMETER
SCALE 1:20 000


(44)
N
(Joins sheet 38)
R. 11 W. | R. 10 W.
1 085 000 FEET
T. 37 S. | T. 36 S.
(Joins inset, sheet 67)
290 000 FEET
280 000 FEET
(Joins sheet 45)
1 055 000 FEET
(Joins sheet 51)
South Bend Mtn.
SISKIYOU
NATIONAL
FOREST
ILLINOIS RIVER
Sulphur Creek
Florence Creek
Klondike Creek
Yukon
33
34
35
36
30
29
28
3
2
1
31
32
33
10
11
12
6
5
4
15
14
13
9G
6F
7F
8G
81G
72F
80G
48F
82G
61B
1B
47E
1 MILE
1 KILOMETER
SCALE 1:20 000

N


1 090 000 FEET
R. 10 W.
R. 9 W.
(Joins sheet 39)
290 000 FEET
T. 37 S.
T. 36 S.
(Joins sheet 44)
(Joins sheet 46)
290 000 FEET
(Joins sheet 52)
1 120 000 FEET
SISKIYOU
NATIONAL
FOREST
ILLINOIS
RIVER
Pine Creek
Clear Creek
Pine Flat
York Butte
Panther Creek
Red Dog Creek
Briggs Creek
York Creek
Haydon Creek
Soldier Cr.
81G
8G
27
26
25
30
29
28
27
9G
5G
1B
15
64
34
35
36
31
32
33
34
48F
47F
80G
82G
37G
35F
36F
58F
58G
29F
21F
20F
37G
80G
75F
81G
71F
70F
69E
72F
42E
3
2
1
6
5
4
3
14
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
1
0.5
0
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 46




1 160 000 FEET
R. 8 W.
R. 7 W.
(Joins sheet 41)
285 000 FEET
T. 37 S.
T. 36 S.
(Joins sheet 46)
(Joins sheet 48)
275 000 FEET
(Joins sheet 54)
1 185 000 FEET
N
SISKIYOU
NATIONAL
FOREST
State
Cedar
Log
Creek
Waters
Creek
Creek
Root
Spring
Bear
Creek
Ramsey
Creek
Salt
Creek
Gulch
Newt
Blue
Gulch
Round
Prairie
South
Fork
Round
Prairie
Creek
Creek
27
26
25
30
29
28
27
26
34
35
36
31
32
33
34
35
3
2
1
6
5
4
3
2
81G
58G
58F
21F
47E
28F
19E
48F
72F
7F
6F
9G
8G
61D
53E
67C
69C
79F
77E
78F
20F
72F
48F
79F
1 MILE
1 3/4 1/2 1/4 0
1 0.5 0 1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 48



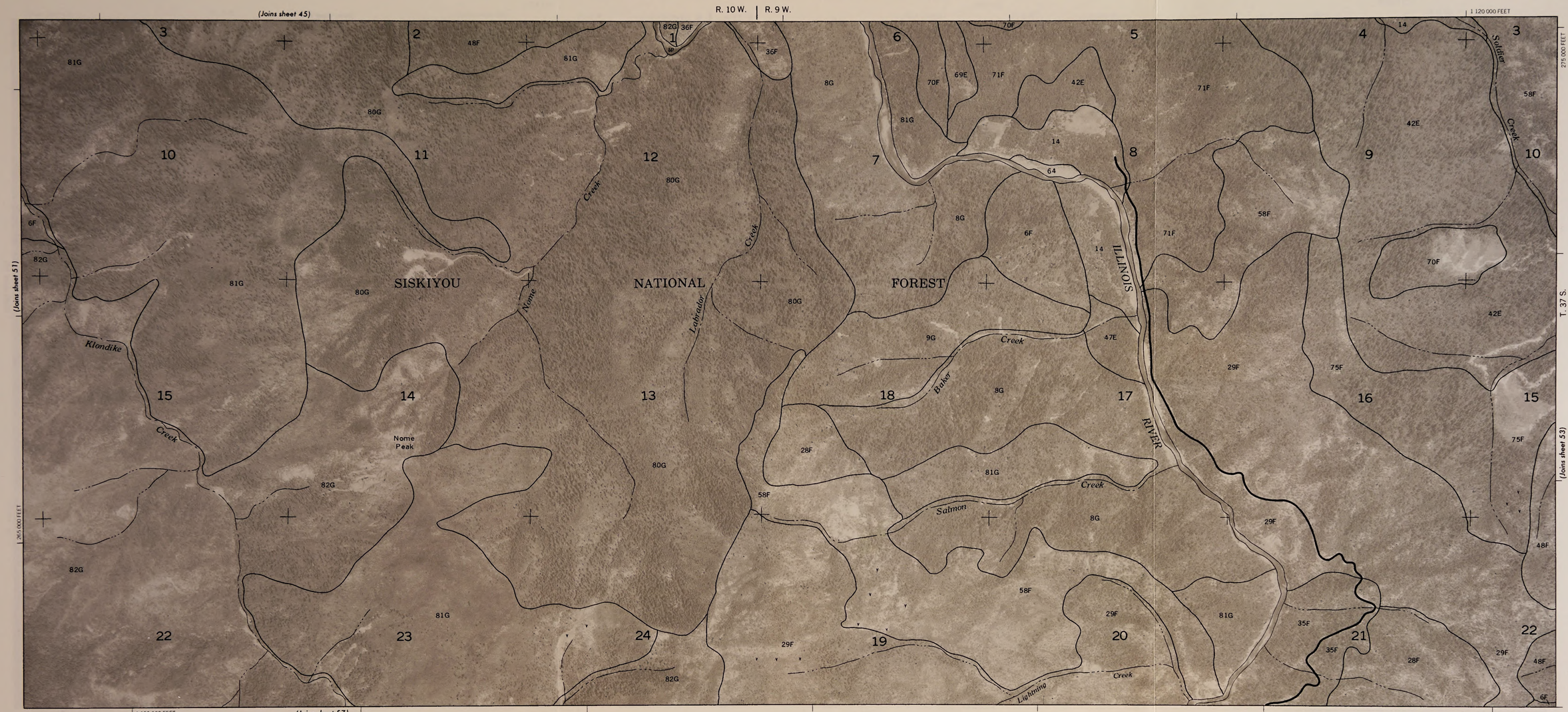

R. 6 W.
R. 5 W.
T. 37 S.
T. 36 S.
(Joins sheet 48)
(Joins sheet 43)
(Joins sheet 50)
(Joins sheet 56)
1 225 000 FEET
285 000 FEET
275 000 FEET
1 255 000 FEET
Allen Creek
Baldy Mtn.
Pickett Mtn.
Grants Pass Peak
1 MILE
1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 50




1 055 000 FEET
R. 11 W.
R. 10 W.
(Joins sheet 44)
T. 37 S.
275 000 FEET
(Joins inset)
ILLINOIS
RIVER
SISKIYOU
NATIONAL
FOREST
Klondike
Creek
Yukon
Creek
Hayward
Peak
CURRY
COUNTY
(Joins sheet 52)
285 000 FEET
1 085 000 FEET
1 045 000 FEET
(Joins inset, sheet 67)
278 000 FEET
Indian Creek
(Joins upper left)
272 000 FEET
1 050 000 FEET
3000 AND 5000-FOOT GRID TICKS
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000
N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 52




1 125 000 FEET
R. 9 W.
R. 8 W.
(Joins sheet 46)
275 000 FEET
T. 37 S.
(Joins sheet 52)
(Joins sheet 54)
1 250 000 FEET
1 155 000 FEET
(Joins sheet 58)
N
SISKIYOU NATIONAL FOREST
Serpentine Point
Lookout Gap
Squaw Mtn.
Horse Creek
Soldier Creek
Sucgle Creek
Clear Creek
Sixmile Creek
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000


N
(Joins sheet 47)
R. 8 W.
R. 7 W.
1 185 000 FEET
270 000 FEET
T. 37 S.
(Joins sheet 53)
(Joins sheet 55)
260 000 FEET
1 155 000 FEET
(Joins sheet 59)
SISKIYOU NATIONAL FOREST
Red Flat
Wonder
Ramsey Creek
Slate Creek
Waters Creek
Newt Gulch
Squaw Gulch
Clear Creek
Butcher Knife Creek
Lone Knight Creek
Wolf Creek
Elliott Creek
Chetcoe Creek
199
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


199
1 190 000 FEET
R. 7 W.
R. 6 W.
(Joins sheet 48)
N
T. 37 S.
(Joins sheet 54)
(Joins sheet 56)
(Joins sheet 60)
1 220 000 FEET
APPLEGATE
RIVER
Cheney Creek
Jackson Creek
Bear Mtn.
Eagle Mtn.
Marble Mtn.
Panther Creek
Graham Gulch
1 MILE
1 KILOMETER
SCALE 1:20 000


(Joins sheet 49)
R. 6 W.
R. 5 W.
1 255 000 FEET
270 000 FEET
T. 37 S.
(Joins sheet 55)
(Joins inset A, sheet 72)
260 000 FEET
1 225 000 FEET
(Joins sheet 61)
APPLEGATE
RIVER
Onion Creek
Grays Creek
Murphy Creek
Panther Creek
SCALE 1:20 000
1 MILE
1 KILOMETER


1 090 000 FEET
R. 10 W. | R. 9 W.
(Joins sheet 52)
260 000 FEET
Klondike Creek
Lightning Creek
CURRY COUNTY
SISKIYOU NATIONAL FOREST
Gold Basin Butte
McGuire Gulch
ILLINOIS RIVER
Daily Creek
Ranchette Creek
Fall Creek
Flack Creek
West Fork
(Joins sheet 58)
T. 38 S. | T. 37 S.
245 000 FEET
(Joins sheet 62)
1 120 000 FEET
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

58

N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 58



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


1 160 000 FEET
R. 8 W. | R. 7 W.
(Joins sheet 54)
SISKIYOU NATIONAL FOREST
Hays Hill
Mooney Mtn.
Clear Creek
Anderson Creek
Elliott Creek
Cheney Creek
Grave Creek
Davis Creek
Quines Creeks
295 000 FEET
T. 38 S. | T. 37 S.
(Joins sheet 58)
(Joins sheet 60)
1 295 000 FEET
(Joins sheet 64)
1 185 000 FEET
N
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 60




R. 6 W.
R. 5 W.
1 225 000 FEET
1 255 000 FEET
1 240 000 FEET
T. 38 S.
T. 37 S.
(Joins sheet 56)
(Joins sheet 60)
(Joins sheet 66)
(Joins inset B, sheet 72)
N
Packers Gulch
Murphy Creek
Grave Creek
Miller Creek
ALMEGATE
RIVER
SCALE 1:20 000
1 MILE
1 KILOMETER

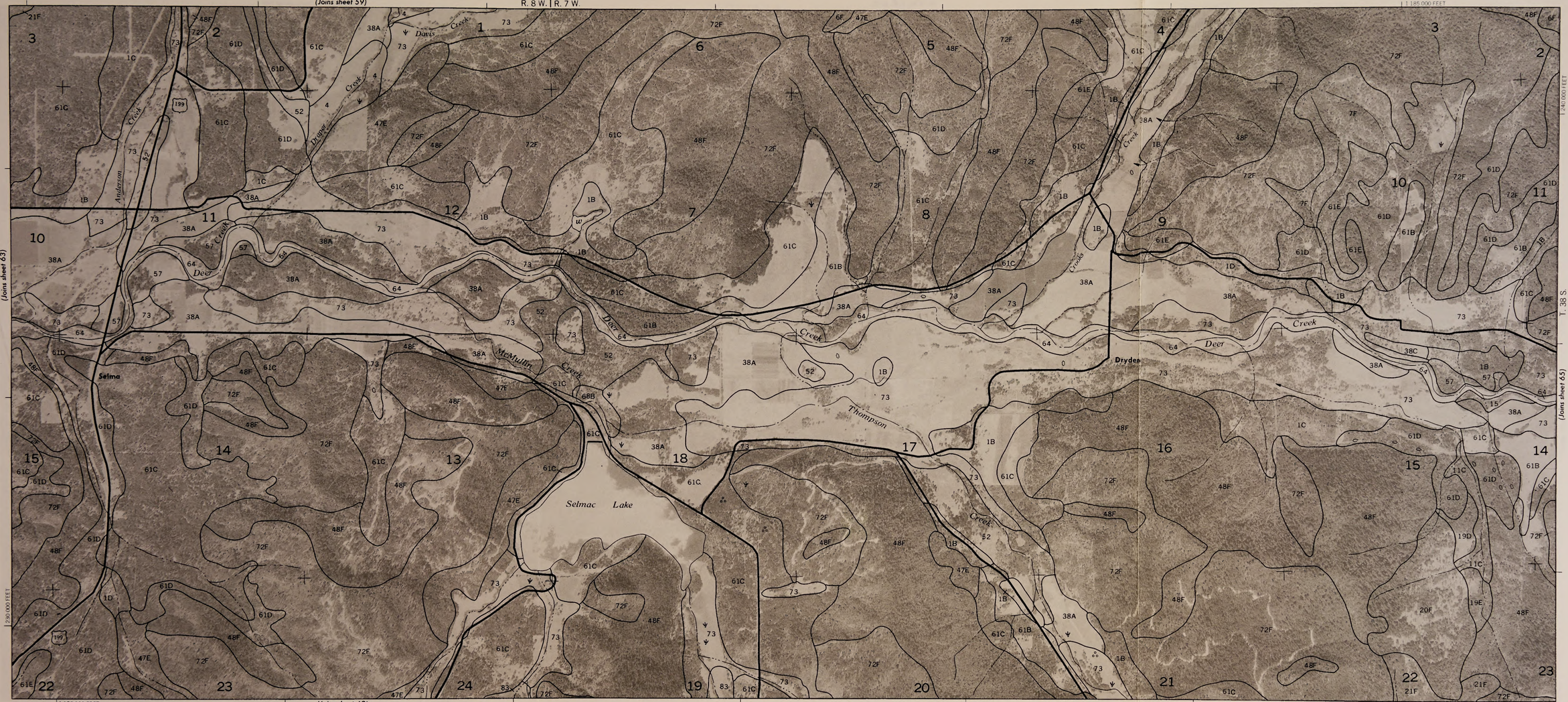
N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 62




N
R. 9 W.
R. 8 W.
T. 38 S.
(Joins sheet 58)
(Joins sheet 62)
(Joins sheet 64)
(Joins sheet 68)
1 125 000 FEET
1 150 000 FEET
20 000 FEET
SISKIYOU
NATIONAL
FOREST
RIVER
ILLINOIS
Hoover Gulch
Alder Gulch
Smallback Creek
Cedar Gulch
Kerby Flat
Star Flat
Deer Creek
Squaw Creek
Deer Creek
Eight Dollar Mountain
Faye Gulch
Mikes Gulch
1 MILE
1 KILOMETER
SCALE 1:20 000

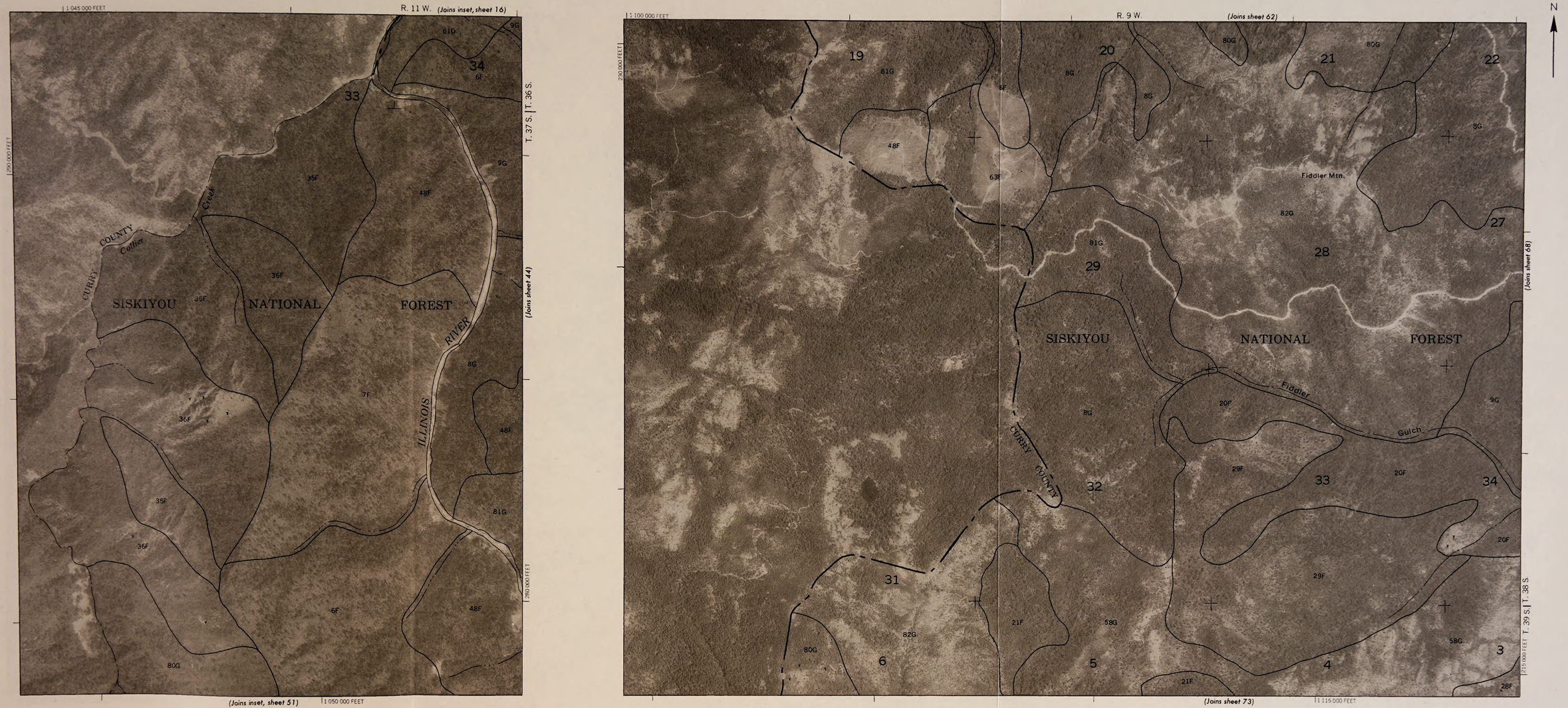
SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 64




1 190 000 FEET
R. 7 W.
R. 6 W.
(Joins sheet 60)
T. 38 S.
(Joins sheet 64)
(Joins sheet 66)
(Joins sheet 70)
1 240 000 FEET
1 230 000 FEET
1 220 000 FEET
N
Deer Creek
North Fork Deer Creek
Murphy Creek
Spencer Creek
Murphy Mtn.
Mungers Butte
Water Creek
Smith Fork Deer Creek
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 66




1 045 000 FEET
R. 11 W.
(Joins inset, sheet 16)
1 100 000 FEET
R. 9 W.
(Joins sheet 62)
290 000 FEET
280 000 FEET
T. 37 S.
T. 36 S.
(Joins sheet 44)
250 000 FEET
(Joins sheet 68)
215 000 FEET
T. 39 S.
T. 38 S.
SISKIYOU
NATIONAL
FOREST
COUNTY
Coffee Creek
CURRY
ILLINOIS
RIVER
Fiddler Mtn.
Fiddler
Gulch
CURRY COUNTY
(Joins inset, sheet 51)
1 050 000 FEET
(Joins sheet 73)
1 115 000 FEET
N
1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 63)
R. 9 W.
R. 8 W.
1 150 000 FEET
(Joins sheet 67)
SISKIYOU
NATIONAL
FOREST
Days
Gulch
Creek
Josephine
Fiddler
Gulch
Nogle
Creek
ILLINOIS
RIVER
Reeves
Creek
199
(Joins sheet 69)
T. 39 S.
T. 38 S.
315 000 FEET
1 120 000 FEET
(Joins sheet 74)
1 MILE
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000


1 155 000 FEET
R. 8 W.
R. 7 W.
(Joins sheet 64)
(Joins sheet 68)
(Joins sheet 70)
(Joins sheet 75)
T. 39 S.
T. 38 S.
295 000 FEET
215 000 FEET
1 185 000 FEET
McMullin Creek
Thompson Creek
Reuter Creek
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 70



SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 71

71



SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 72



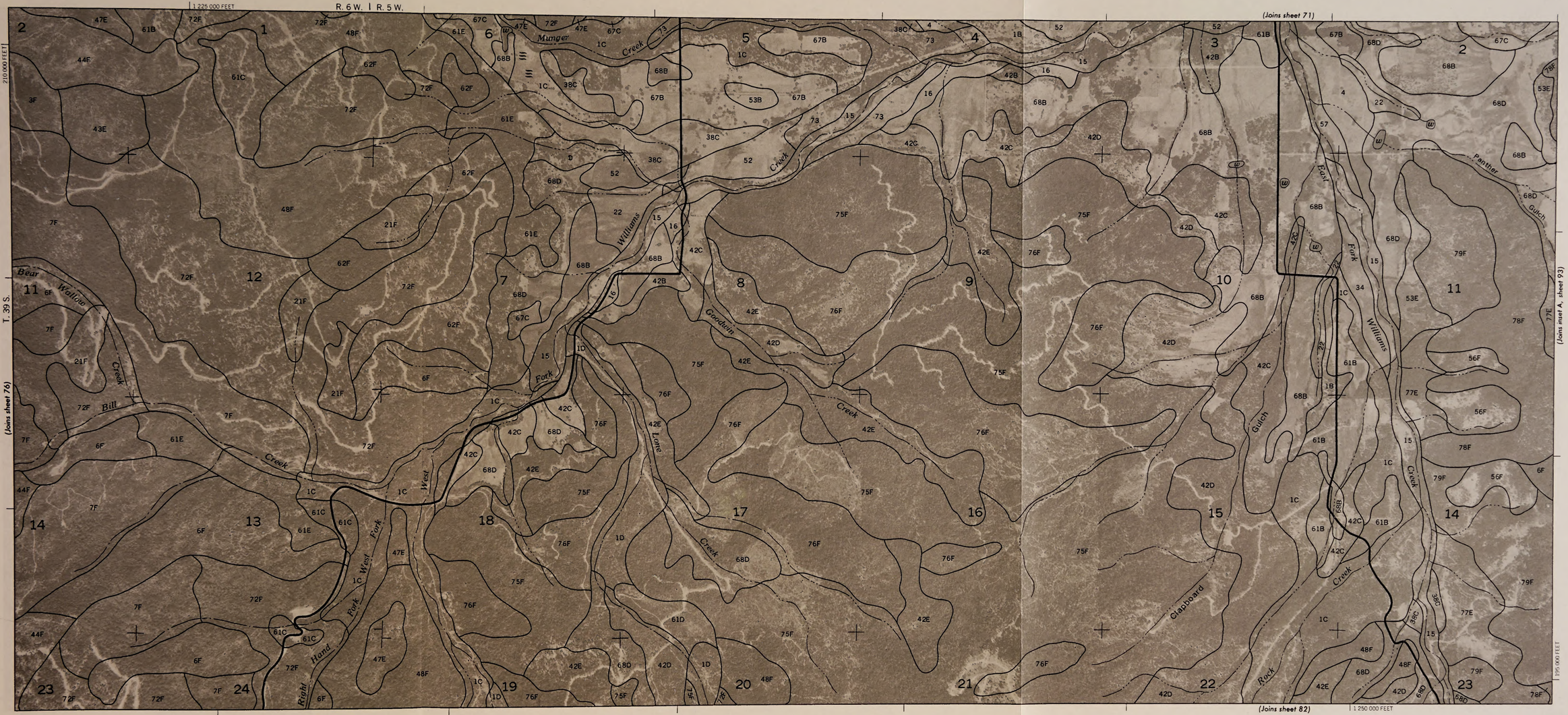

1 090 000 FEET
215 000 FEET
(Joins sheet 67)
R. 10 W.
9 W.
T. 39 S.
(Joins sheet 74)
SISKIYOU
NATIONAL
FOREST
CURRY COUNTY
Canyon Peak
Lightning Gulch
Canyon Creek
South Fork
Bar
Rocky
Hansen Gulch
Gulch
80G
82G
21F
58G
29F
81G
28F
20F
1
2
3
4
5
6
7
8
9
10
12
15
16
17
18
19
20
21
22
(Joins sheet 78)
1 115 000 FEET
300 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 74




1 155 000 FEET
R. 8 W.
R. 7 W.
(Joins sheet 69)
210 000 FEET
T. 39 S.
(Joins sheet 74)
(Joins sheet 76)
300 000 FEET
(Joins sheet 80)
1 185 000 FEET
N
Reeves Creek
Holton Creek
Chapman Creek
Rattlesnake Creek
East Fork Chapman Creek
Lime Rock Creek
McMullin Creek
Tiger Creek
Perdin Creek
Bear Creek
Nelson Creek
Cone Creek
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 70)
R. 6 W. I R. 7 W.
1 220 000 FEET
210 000 FEET
T. 39 S.
(Joins sheet 75)
(Joins sheet 77)
200 000 FEET
1 190 000 FEET
(Joins sheet 81)
Little Grayback Peak
South Fork Deer Creek
Bear Wallow Creek
Holcomb Peak
Bill Creek
Grayback Creek
Lake Creek
Rock Creek
White
Nelson Creek
Little
SISKIYOU
NATIONAL
FOREST
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


R. 6 W. I R. 5 W.
1 225 000 FEET
2100000 FEET
T. 39 S.
(Joins sheet 71)
(Joins sheet 76)
(Joins inset A, sheet 93)
(Joins sheet 82)
1 250 000 FEET
1 950 000 FEET
N
Munger Creek
Williams Creek
Bear Wallow Creek
Bill Creek
West Fork Hand Right Fork
Lone Fork Goodwin Creek
East Fork Williams Creek
Panther Gulch
Clapboard Gulch
Rock Creek
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

N



R. 10 W. | R. 9 W.

1 3/4 1/2 1/4 0 1 MILE

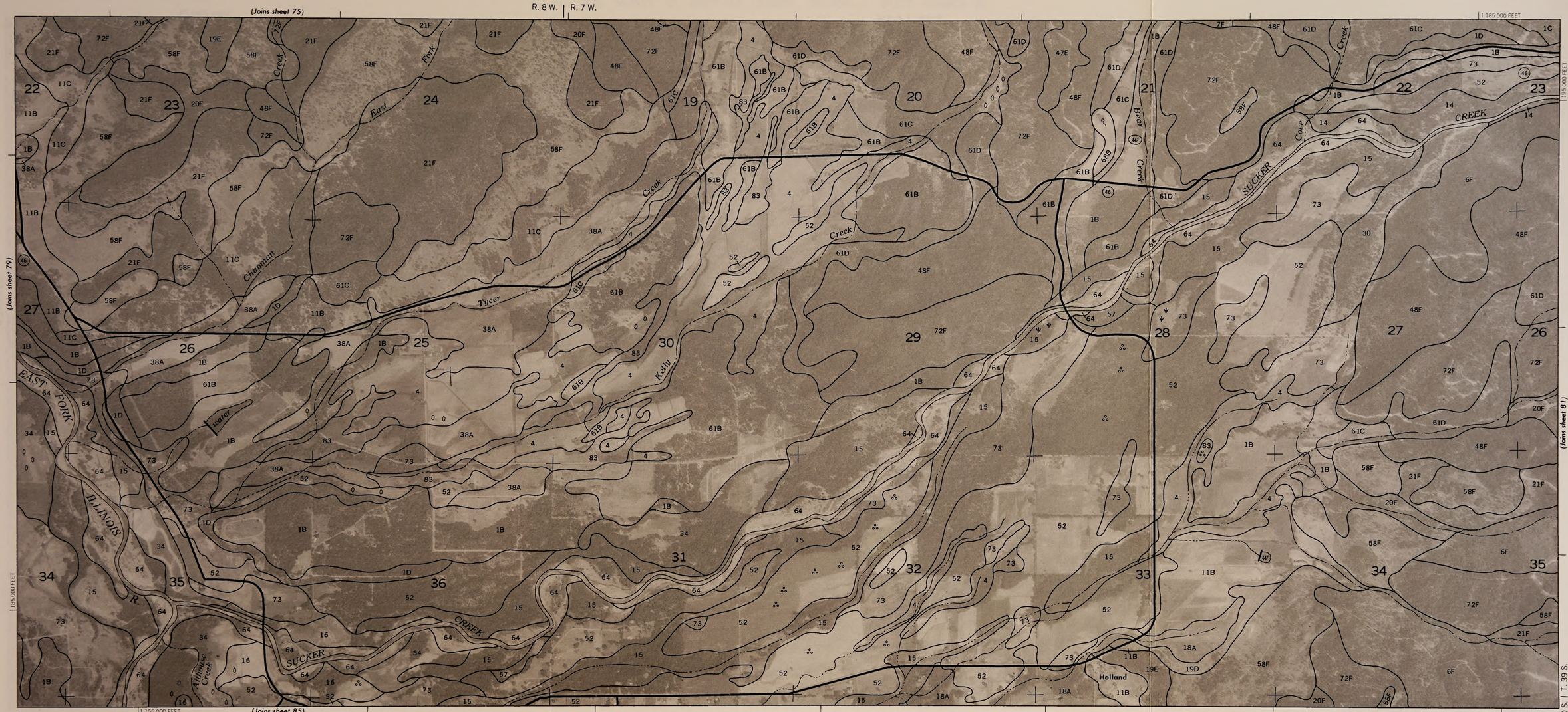
1 0.5 0 1 KILOMETER

SCALE 1:20 000


1 120 000 FEET
R. 9 W.
R. 8 W.
(Joins sheet 74)
195 000 FEET
(Joins sheet 78)
(Joins sheet 80)
T. 40 S.
T. 39 S.
SISKIYOU
NATIONAL
FOREST
Woodcock Mtn.
Josephine Creek
Woodcock Creek
ILLINOIS RIVER
EAST FORK
ILLINOIS RIVER
WEST FORK
ILLINOIS RIVER
Cave Junction
(Joins sheet 84)
1 150 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000

N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 80




1 190 000 FEET
R. 7 W.
R. 6 W.
(Joins sheet 76)
195 000 FEET
(Joins sheet 80)
(Joins sheet 82)
185 000 FEET
T. 40 S.
T. 39 S.
(Joins sheet 86)
1 220 000 FEET
N
SISKIYOU
NATIONAL
FOREST
Squaw Mtn.
Little Sucker Creek
Grayback Creek
Lake Creek
Sucker Creek
Grayback Creek
White Rock Creek
Marshlack Creek
Grayback Creek
Lost Canyon Creek
Cave Creek
1 MILE
1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 77)
R. 6 W. | R. 5 W.
1 250 000 FEET
(Joins sheet 81)
1 225 000 FEET
(Joins sheet 87)
(Joins inset B, sheet 93)
T. 40 S. | T. 39 S.
Little Sugarloaf Peak
SISKIYOU NATIONAL FOREST
ROGUE RIVER NATIONAL FOREST
R. R. N.F.
Right Hand Fork
West Fork
Williams Creek
Rock Creek
Grade Creek
East Fork Williams Creek
Grayback Creek
Windy Creek
1 MILE
1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 83



SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 84





1 3/4 1/2 1/4 0 1 MILE

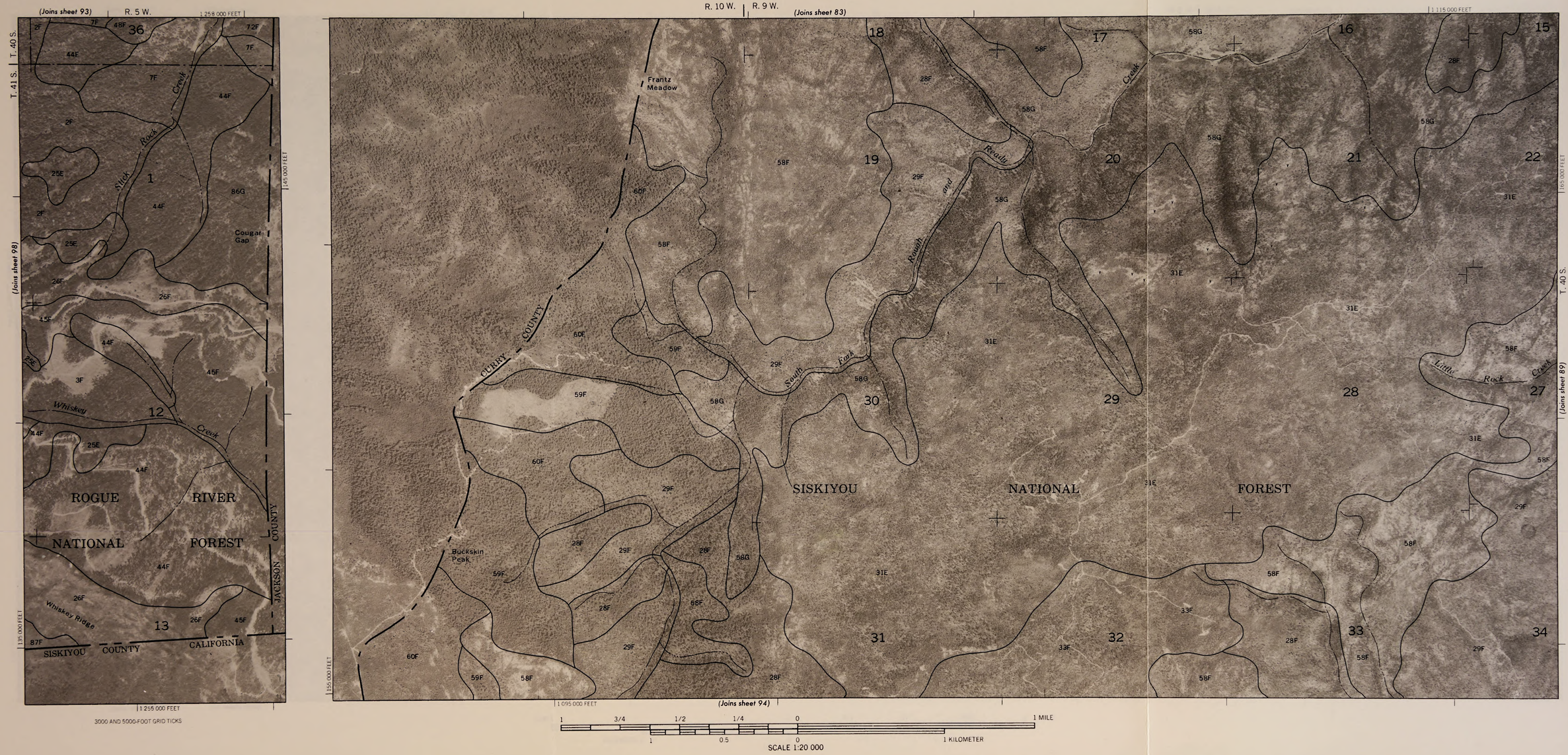
1 0.5 0 1 KILOMETER

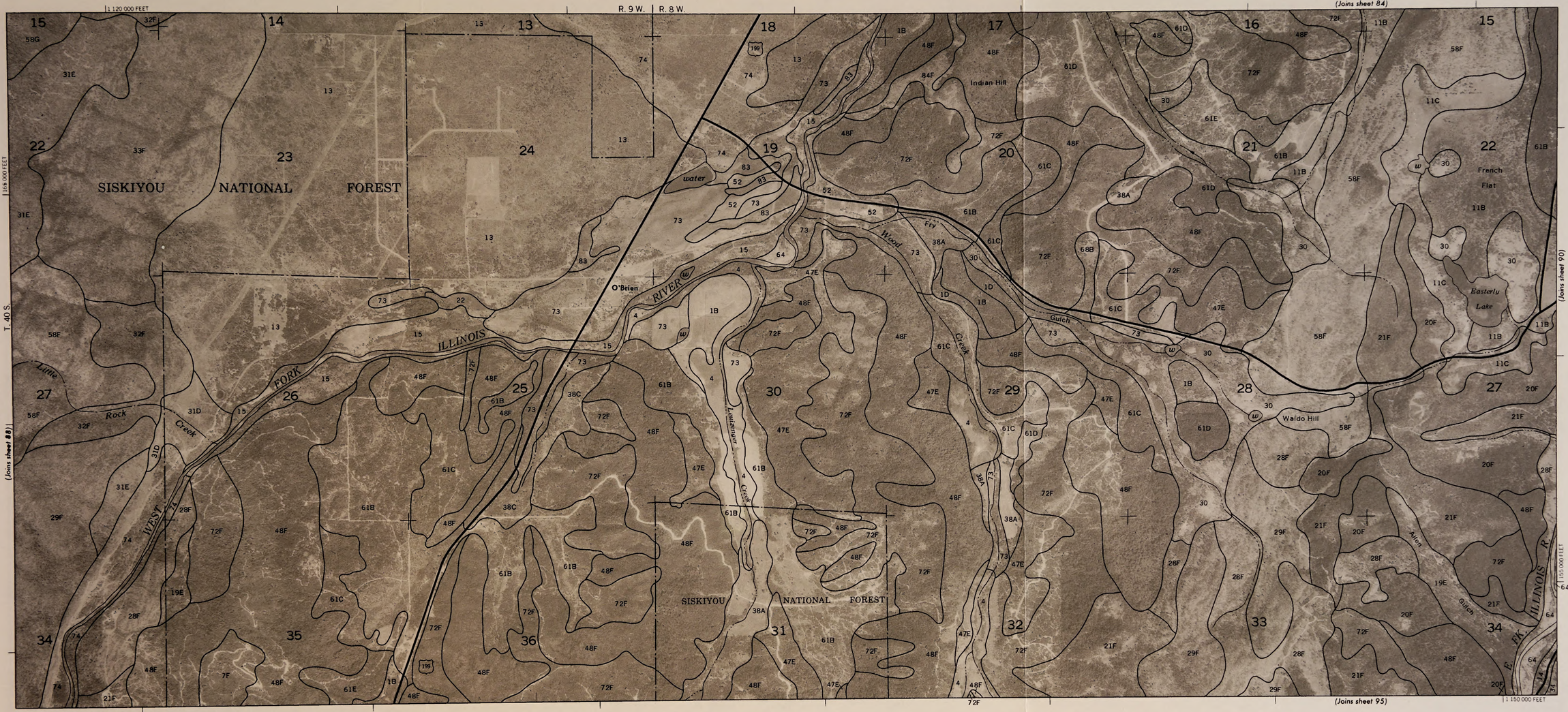
SCALE 1:20 000


N
(Joins sheet 81)
R. 7 W.
R. 6 W.
1 220 000 FEET
180 000 FEET
T. 40 S.
(Joins sheet 85)
(Joins sheet 87)
(Joins sheet 91)
1 190 000 FEET
170 000 FEET
SISKIYOU
NATIONAL
FOREST
OREGON CAVES NATIONAL MONUMENT
Johnson Gulch
SUCKER Creek
Yeager Creek
Tarter Gulch
Slime Sam Gulch
Serpentine Flat
Number Seven Gulch
Cohen Creek
Cave Creek
Panther Creek
Lake Creek
Limestone Creek
Bigelow Lake
Horse Mtn.
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


1 225 000 FEET
R. 6 W.
R. 5 W.
(Joins sheet 82)
180 000 FEET
T. 40 S.
(Joins sheet 86)
(Joins inset, C sheet 93)
165 000 FEET
(Joins sheet 92)
1 250 000 FEET
N
Big Sugarloaf Peak
Graveback Mtn.
Lake Mtn.
Brightbow Lake
SISKIYOU NATIONAL FOREST
ROGUE RIVER NATIONAL FOREST
Grayback Creek
Jump Off Creek
Fan Creek
Little Fan Creek
Elk Creek
Lake Creek
Deer Creek
Bunker Creek
O'Brien Creek
Sturgis Creek
Sturgis Fork
Lower Creek
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 88




1 120 000 FEET
R. 9 W.
R. 8 W.
(Joins sheet 84)
T. 40 S.
(Joins sheet 88)
(Joins sheet 90)
(Joins sheet 95)
1 150 000 FEET
SISKIYOU NATIONAL FOREST
SISKIYOU NATIONAL FOREST
Indian Hill
Waldo Hill
French Flat
Easterly Lake
O'Brien
ILLINOIS RIVER
WEST FORK
Little Rock Creek
Fry Creek
Wood Gulch
Lawrence Creek
Alien Gulch
E. FK. ILLINOIS R.
water
1 MILE
1 KILOMETER
SCALE 1:20 000

N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 90



SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 91

91



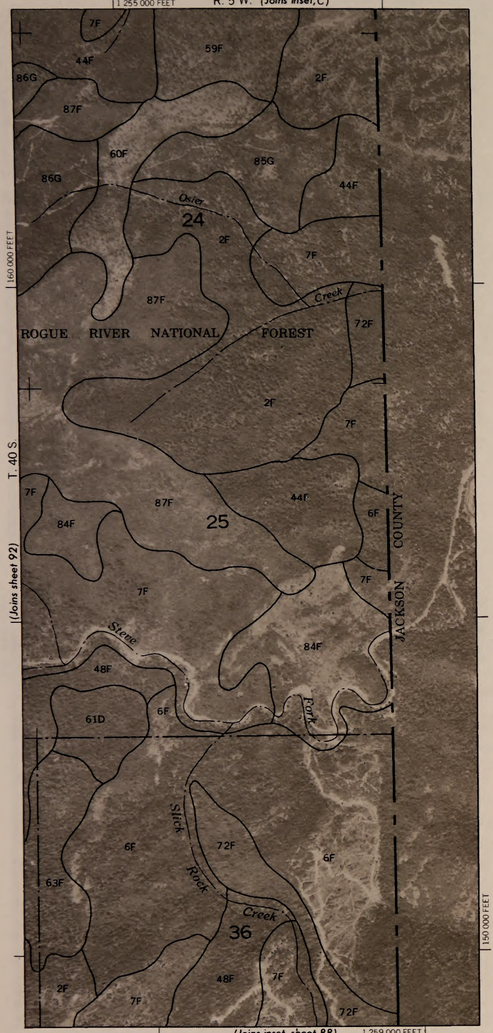


1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

N



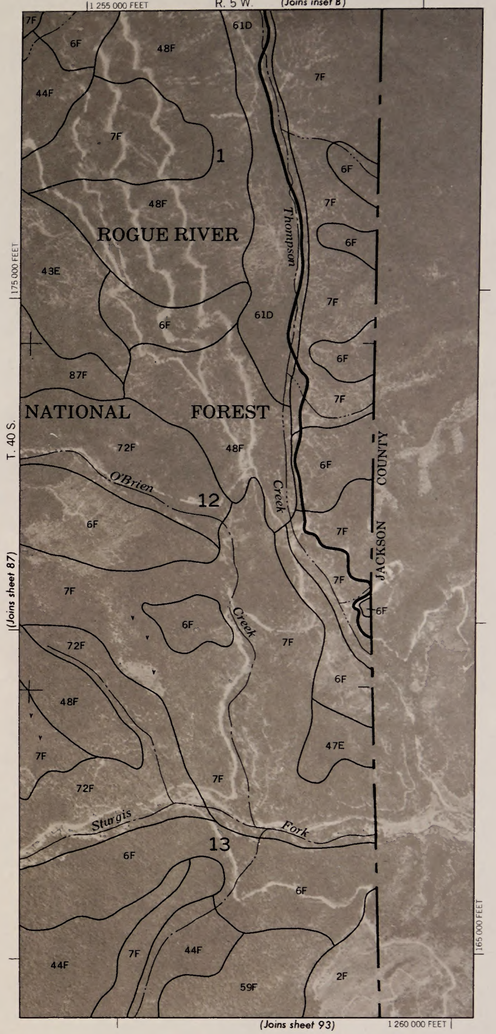
INSET A



INSET B



INSET C



N

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 94

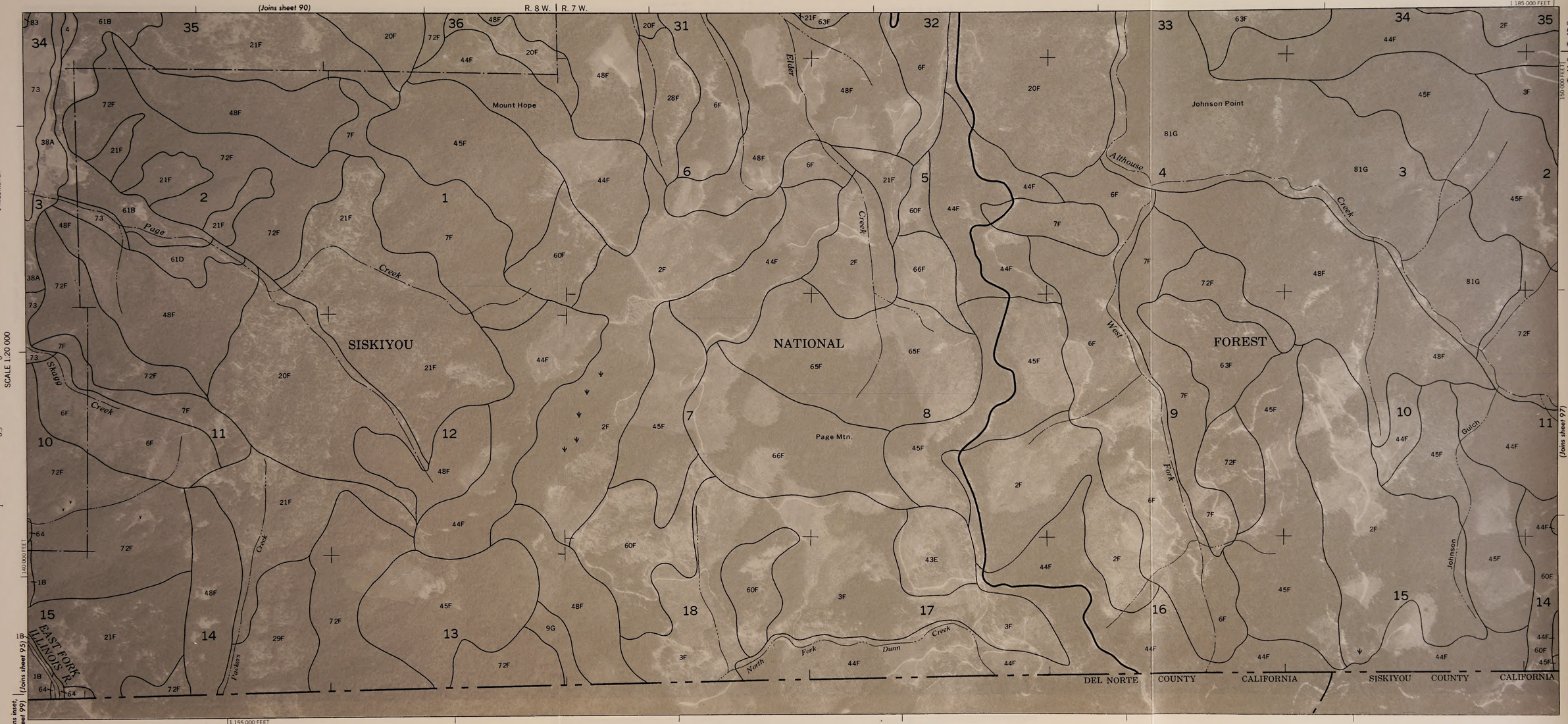


1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


N
1 120 000 FEET
R. 9 W.
R. 8 W.
(Joins sheet 89)
T. 40 S.
T. 41 S.
150 000 FEET
(Joins sheet 94)
(Joins sheet 96)
140 000 FEET
(Joins inset, sheet 99)
1 150 000 FEET
SISKIYOU NATIONAL FOREST
W. FK. ILLINOIS RIVER
ILLINOIS RIVER
EAST FORK
Lone Mtn.
Waldo Hill
Gilligan Butte
Elk Creek
Gilligan Creek
Lemmings Creek
Wood Creek
Scotch Gulch
Page Creek
Skagg Cr.
Cedar Gulch
Ridge
Bearcamp Gulch
Long
Dwight Creek
Trapper Gulch
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


96
N
(Joins sheet 90)
R. 8 W. | R. 7 W.
1 185 000 FEET
T. 41 S. | T. 40 S.
1 150 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000
1 155 000 FEET
(Joins inset sheet 99)
(Joins sheet 95)
(Joins sheet 97)
SISKIYOU
NATIONAL
FOREST
Mount Hope
Johnson Point
Page Mtn.
Page Creek
Skago Creek
Althouse Creek
Elder Creek
West Fork Dunn Creek
North Fork Johnson Gutch
Packers Creek
EAST FORK ILLINOIS R.
DEL NORTE COUNTY CALIFORNIA
SISKIYOU COUNTY CALIFORNIA

SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 97

97



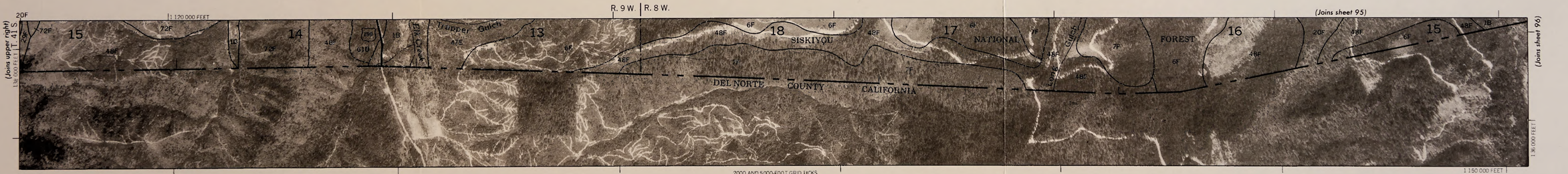
SOIL SURVEY OF JOSEPHINE COUNTY, OREGON — SHEET NUMBER 98



N



3000 AND 5000-FOOT GRID TICKS



2000 AND 5000-FOOT GRID TICKS